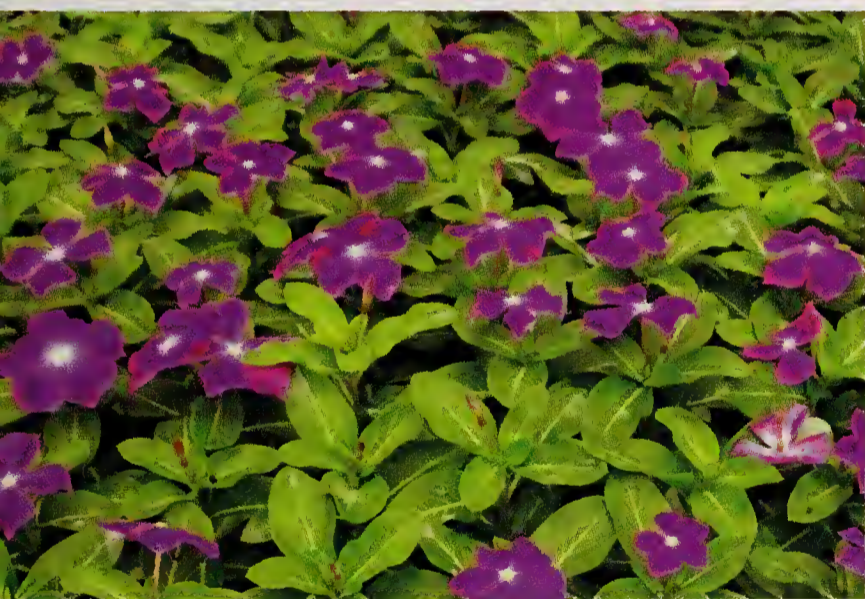
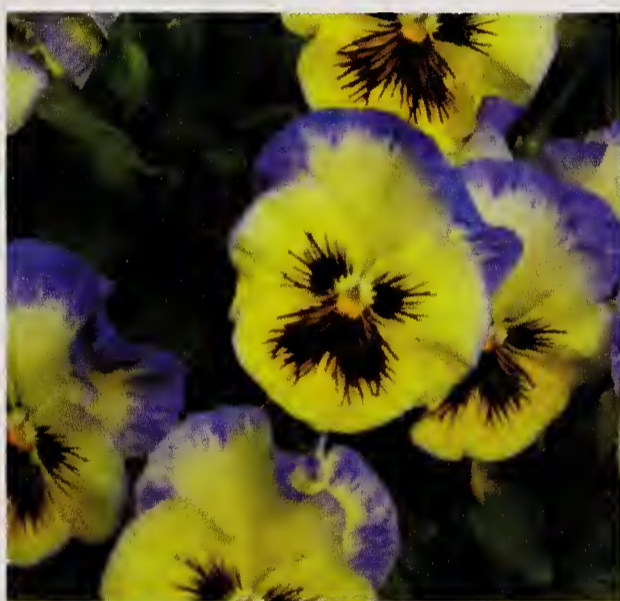


ETHNOBOTANY

Amritpal Singh Saroya



INDIAN COUNCIL OF AGRICULTURAL RESEARCH
NEW DELHI

ETHNOBOTANY

Amritpal Singh Saroya



Published by

Directorate of Knowledge Management in Agriculture
Indian Council of Agricultural Research
New Delhi

PRINTED : July 2017

Project Director (DKMA) : Dr S.K. Singh

Incharge (English Editorial Unit) : Dr Aruna T. Kumar

Editing : Ravindra Verma

Chief Production Officer : Dr V.K. Bharti

Assistant Chief Technical Officer : Punit Bhasin
(*Production*)

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ISBN: 978-81-7164-168-0

Price: ₹450

Foreword

ETHNOBIOLOGY is a discipline of anthropology and is defined as the scientific study of the way plants and animals are treated or used by different human cultures. "Folk biology" is a term commonly used by ethnobiologists to refer to biological classification and reasoning particular to cultural groups. It has three sub-disciplines, ethnobotany, ethnozoology and ethnoecology. Like ethnobiology, ethnobotany makes apparent the connection between human cultural practices and the sub-disciplines of biology.

The subject of ethnobotany has manifold significance. The study of indigenous food production methods and local medicinal knowledge can be utilized for the development of sustainable-agriculture and the discovery of cost-effective and novel medicines. Ethnobotany illuminates linkage between cultural-diversity and biodiversity. Further, it helps in understanding the influence of plants on humans and vice-versa.

The present work is as per the syllabus of Ethnobotany designed by Indian Council of Agricultural Research (ICAR) for undergraduate and postgraduate courses related to Agriculture. The book is a valuable for the academicians as well as the pharmaceutical industry. The book has a definite edge over previous works on Ethnobotany as it beautifully illustrates the link between Ethnobotany, Ethnopharmacology, Traditional Medicine, Phytochemistry and drug-discovery.

Dr. Amritpal Singh, editor of this book is well known for his study of Ayurveda, Traditional Medicine and medicinal plants. He has published a number of papers and book in Ayurveda, Traditional Medicine and medicinal plants. I congratulate him for his valuable contribution to the Ethnobotany literature.

Dr. Arminster Singh Sandhu
In charge Medicinal Plant Garden, Department of Natural Products,
National Institute of Pharmaceutical Education and Research
(NIPER), Mohali

Preface

MEDICINAL plants are a significant source of synthetic and herbal drugs. Medicinal plants have been used for the treatment of diseases since antiquity. India and China have been on the forefront when we talk about the history of herbal drugs. The traditional systems of medicines viz. Ayurveda, Siddha, Unani, Western Herbal Medicine, Traditional Chinese Medicine and Homeopathy have roots in medicinal herbs. Herbal medicine has produced a number of distinguished researchers and due to its accessibility to traditions; it is still practiced even by lay practitioners.

The study of Ethnobotany forms an essential part of syllabus for both undergraduate and postgraduate course related to botany. Ethnobotany is defined as the scientific study of the relationships that exist between peoples and plants. In precise words, Ethnobotany is defined as the Science of people's interactions with plants. The book is designed so as to acquaint the students with the basic fundamentals and the significance of Ethnobotany.

The book, in its present form is meant for the degree students of Botany and Agriculture and covers the syllabus of a majority of the Indian Universities. The book deals with a detailed account of the various aspects of Ethnobotany so as to equip the students with thorough information. Without such information it is not possible to follow a comparative account and a generalized treatment of the subject at advanced levels.

Before the availability of synthetic drugs, man was completely dependent on medicinal herbs for prevention and treatment of diseases. The use of the medicinal herbs for curing disease has been documented in the history of all civilizations. Today herbal research is a worldwide phenomenon and scientists are exploring safe and effective remedies from plants. The literature on ethnomedicinal plants is scattered and need of the hour is to assemble the scientific work on one platform. This book is humble attempt in this direction. We hope it will fulfil the deficiency of standard material on ethno medicinal plants which has been felt for a long period of time.

The work has been divided into seven chapters. The first chapter is dedicated to the definition and scope of Ethnobotany. Various pharmacopeia dealing with herbal systems of medicine is the saline feature of the chapter. Second chapter addressed the importance of biodiversity and natural resources of the earth with respect to plants. The third chapter describes the indigenous and ethnic people and their contribution in development of Ethnobotany.

The fourth chapter gives an overview of folk uses of medicinal plants in a detailed fashion. Hallucinogenic and other medicinal plants in folk medicine and utilization in the Pharmaceutical Industry have been emphasised. A special account of Ethnobotany of medicinal plants used in Ayurveda and Amchi system of medicine has been described so as to extend the utility of the book for AYUSH fraternity. The fifth chapter explains medicinal plants In Indian mythology and symbolic relationships among selected plants.

The sixth chapter deals with important and burning issues of bioprospecting. Wild Life (Protection) Act, 1972, Indian Forest Act, 1927 and The Scheduled Tribes and Other Traditional Forest-Dwellers (Recognition of Forest Rights) Act, 2006 have been included so as to make the reader familiar with linkage of Ethnobotany with bioprospecting. The seventh chapter explains various aspects of Paleoethnobotany, a branch of archaeology which studies how people in the past used plants.

This book, no doubt, claim originality in style and presentation, but is mainly a compilation work done in a matter suitable to the Indian students. The subject matter has been taken from reputed journals, research papers and monographs available on the subject. The author is grateful to the authors and publishers of these journals and books. A list of books and journals, along with names of authors has been given in the bibliography.

The author is highly obliged to Indian Council of Agricultural Research (ICAR) for giving this opportunity for the prestigious assignment. The author wishes to express his sincerest thanks to Dr. Sudhir Pradhan, ICAR-Directorate of Knowledge Management Research, Krishi Anusandhan Bhawan for his constant encouragement and untiring help during the compilation of this book.

The colleagues and students, all over India, are requested to go through the book and send their healthy criticism and suggestions to improve the book.

Dr. Amritpal Singh Saroya
MD (Ayurveda), M Sc (Medicinal Plants)
Herbal Consultant, Mohali

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1

Definition and Scope of Ethnobotany

Introduction

Ethnobiology is a discipline of anthropology and is defined as the scientific study of the way plants and animals are treated or used by different human cultures. "Folk biology" is a term commonly used by ethnobiologists to refer to biological classification and reasoning particular to cultural groups. It has three sub-disciplines, ethnobotany, ethnozoology and ethnoecology. Like ethnobiology, ethnobotany makes apparent the connection between human cultural practices and the sub-disciplines of biology.

Study of ethnobotany ranges across time and space, starting from investigations based on archaeology in the role of plants in old civilizations to the bioengineering of novel crops. The spectrum of ethnobotany is applicable to non-industrialized or non-urbanized societies. Co-adaptation of plants and human cultures has resulted in the intensification of urbanization and globalization in the 21st century. Indigenous and non-westernized cultures have played a critical role in the development of ethnobotany, as are blessed with knowledge of local ecology possessed through centuries of observations and experiential interactions with the biotic factors of the environment.

The subject of ethnobotany has manifold significance. The study of indigenous food production methods and local medicinal knowledge can be utilized for the development of sustainable-agriculture and the discovery of cost-effective and novel medicines. Ethnobotany illuminates linkage between cultural-diversity and biodiversity. Further, it helps in understanding the influence of plants on humans and *vice-versa*.

Definition of Ethnobotany

Since the dawn of human-civilization, people have used plants as multiple uses (food, shelter, medicines, and materials for construction, the manufacture of crafts and tools, fuel, paints and poison). The ritual characters of plants have been described and are employed for a wide range of properties. Today, plants are being explored from phytochemical, genetics and ethnopharmacological perspective for the possible benefit

of the humanity. Now-a-days their chemical and genetic characters are increasingly explored for human benefits. The credit of this advancement goes to ethnobotany that has provided a solid platform for authentic information on useful as well as harmful aspects of plants.

Ethnobotany is defined as the scientific study of the relationships that exist between people and plants. The term 'Ethnobotany' was coined by Richard Evans Schultes who is rightly addressed as Father of Ethnobotany. As per Schultes, ethnobotany simply means investigating plants used by primitive societies in various parts of the world. The credit of proposing separate discipline of ethnobotany goes to Harshberger. He emphasized on scope and original research methodologies for ethnobotany. Turner in 1996 gave a simple definition of ethnobotany. As per Turner, ethnobotany is defined as the science of people's interactions with plants. Turner's definition is preferred to as given by Harshberger.

The spectrum of ethnobotanical knowledge is not limited to wild species only, but it includes domesticated ones also. The ethnobotanical knowledge has roots in observation, relationship, needs, and traditional ways of knowledge. The evolution of such knowledge takes place over time, and keeps on changing, thereby adding new discoveries and methods.

In fact, ethnobotany is an integrative and multi-disciplinary subject. Botany, taxonomy, anthropology, medicine, pharmacology (ethnopharmacology), and chemistry are integral parts of ethnobotanical studies. Ethnobiology is defined as the study of the relationships between people, the life forms surrounding them, and the environment in which they live, in the past or present. Ethnobotany is included within the greater category of ethnobiology. The botanical collections of early explorers and the later ethnobotany have played important roles in the development of new drugs for many centuries (Fig. 1).

Historical Aspects

It is not easy to trace the history of herbal medicine. Historical evidences, however, do indicate that medicinal plants were used in ancient civilizations. Primitive man observed and appreciated the great diversity of plants available to him. First written documented evidence of use of medicinal plants as health care system comes from China (2800 BC). Much of the medicinal use of plants seems to have been developed through observations of wild animals, and by trial and error.

Hung (3000 BC), the great Chinese emperor, wrote account on 365 medicinal plants in his work, *Pen Ts ao.ching* (Divine Husbandman's Materia Medica). The work is considered to be the earliest extant Chinese Pharmacopoeia. Nong documented the use of Ma Huang

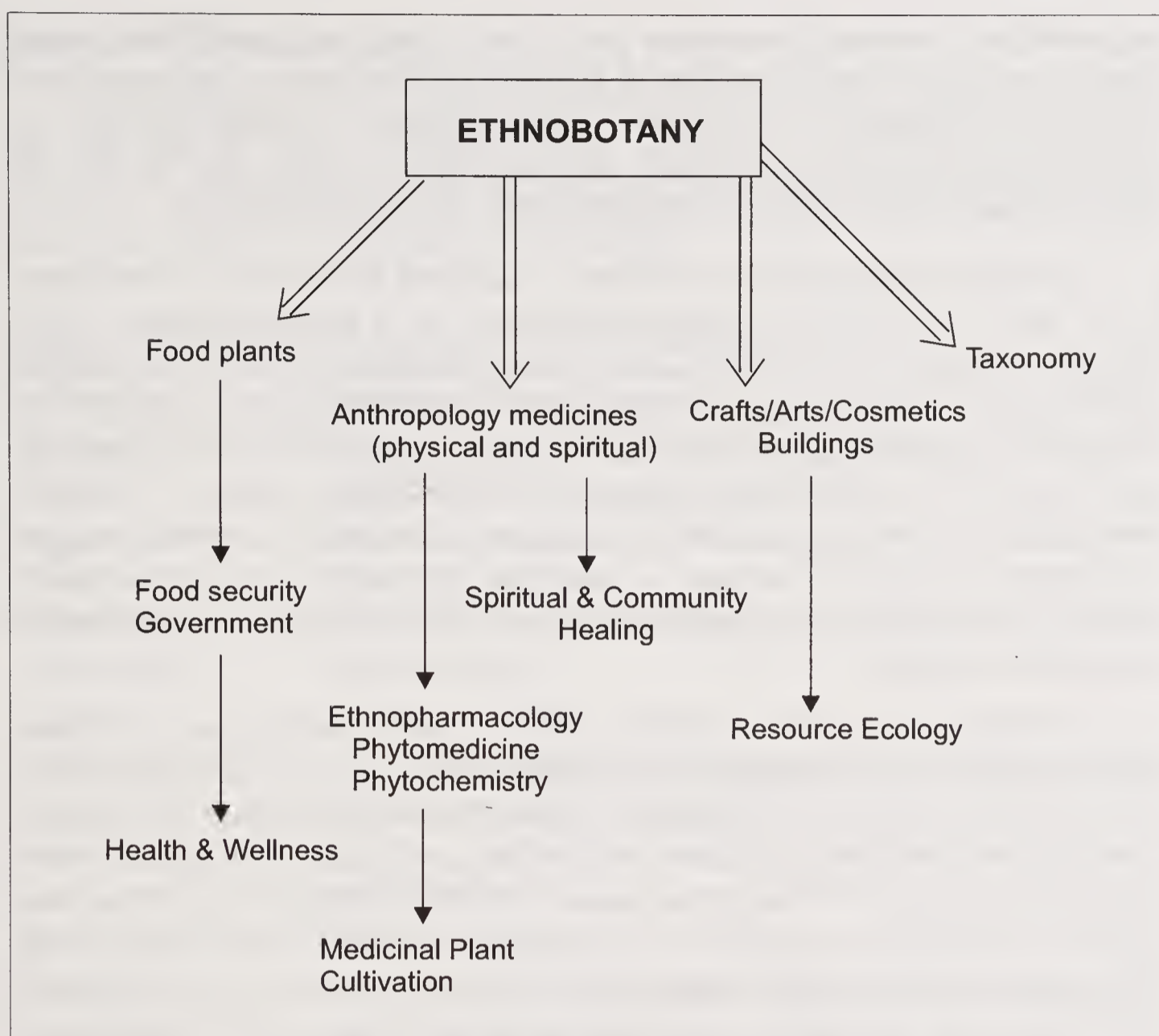


Fig. 1. Integrative and multi-disciplinary nature of ethnobotany (adapted from Phytoalchemy Health and Wellness)

(Ephedra) in the treatment of respiratory illness like bronchitis and asthma. Hammurabi, a king of Babylonia (1800 BC), wrote an account on usage of medicinal plants. He documented the use of peppermint in the treatment of digestive system ailments. Hammurabi prescribed the use of mint for digestive disorders.

Hippocrates (400 BC) wrote the first Greek herbal text. He explained the role of diet, exercise and medicine in maintaining optimal health. Galen (200 AD), practitioner of herbal medicine classified diseases, according to the human anatomy. He further indicated specific remedies to cure diseases. Avicenna (1100 AD), the great Arabian physician, wrote the *Canon of Medicine*. Dioscorides, a Roman physician, wrote *De Materia Medica*, which described the medicinal use of plants ranging from almond to wormwood. *De Materia Medica* was the first systematic pharmacopoeia and was translated and preserved by the Arabs, and finally translated back into Latin by the 10th century.

Culpepper (1600 AD) wrote principle and practice of herbal medicine in his work *The English Physician*. He has described 1653 drugs with information on mode of preparation and dose. Many of his

unpublished manuscripts were published after his death, but many more were lost in the Great Fire of London in 1666. Marcus Aurelius (AD 161-180) explained the use of opium (*Papaver somniferum*) in the treatment of headache, epilepsy, asthma and skin diseases. In fact, he documented use of medicinal herbs in his work *Meditations*.

Ayurveda originated from *Atharva Veda* and Vedic era is considered to be the time when Ayurveda flourished as a medical science. It is estimated that around 1000 BC, two principal texts of Ayurveda, *Charaka Samhita* and *Sushruta Samhita* were composed. *Charaka* and *Sushruta* are pioneers of Ayurvedic medicine and surgery, respectively. Both the texts have dealt in detail with the use of medicinal plants. Chebulic myrobalans (*Terminalia chebula*), *arjuna* (*Terminalia arjuna*), guggul (*Commiphora mukul*), *shatavari* (*Asparagus officinalis*) and *ashwagandha* (*Withania somnifera*) are popular medicinal plants targeted for application in modern science.

The time interval from 1488 to 1682 is known as the age of herbals. Otto Brunfels wrote herbal text in 1488, which was published in 1534. This period produced a number of distinguished herbalists like Gesner Conrad, Leonhard Fuchs, Hieronymus Boch, William Turner and John Parkinson. Friedrich Wilhelm Serturmer (1783-1841) isolated morphine from *Papaver somniferum* in 1805 and showed the medical world that certain chemical constituents are responsible for curative actions of plant based remedies. The scientific community will always remain thankful to Serturmer for his great service to world of medicinal plants.

Felix Hoffman isolated aspirin from willow bark (*Salix* spp.) His work augmented the rational use of willow bark by ancient people. The bark was used in the treatment of arthritis and rheumatism. Aspirin is still prescribed in reducing pain and stiffness associated with joints. William Withering (1741-1799) reported to the scientific community about separation of the cardiac glycoside, digoxin from foxglove (*Digitalis purpurea*). The discovery of digoxin proved to be a milestone in the history of medicine (particularly cardiology) as digoxin was once upon a time first line drug in treating cardiac edema.

Jean Robiquet reported the isolation of antitussive alkaloid, codeine from the opium plant in 1832. Klie isolated reserpine from *Rauwolfia serpentina* in 1952 and the alkaloid remained as the drug of choice for the treatment of hypertension for almost 50 years. This was not just end of the story. Clark Noble did a great service for humanity by discovering Vinca alkaloids from the Madagascar periwinkle (*Catharanthus roseus* L.) in 1957. Vinca alkaloids (vinblastine and vincristine) are priced drugs for treating leukemia. Discovery of taxol from Pacific yew (*Taxus brevifolia*) by Mansukh in 1961 and silymarin from milk thistle (*Silybum marianum*) by Masquelier are some recent examples of drugs obtained from plants.

Scope of Ethnobotany

Ethnobotany is an interdisciplinary science, which covers aspects of the sciences as well as humanities. Ethnobotany, therefore, serves as a gateway to many academic disciplines. The following disciplines are part and parcel of ethnobotanical studies.

Table 1. Relevance of ethnobotany with other disciplines

Disclipline	Relevance to ethnobotany
Agriculture	Study of human domestication and management of plants, especially traditional agricultural systems
Agro-forestry	Study of land management for the simultaneous production of food, crops and trees
Anthropology	The study of how different cultures use plants
Archaeology	Paleoethnobotany
Botany	The study of plants
Chemistry	Study of the composition of substances and active chemicals in plants, especially medicinal plants
Ecology	How human interactions with plants and ecosystems affect plant ecology
Economics	Economic botany
Forestry	Study of human management of forests and forest trees
Horticulture	Study of management of useful plants (fruits, vegetables, ornamentals) in home gardens or orchards
Linguistics	Study of linguistic terminology of plants and plant parts by people of different language groups
Medicine	Study of medicinal uses of plants
Religious Studies	Ritual uses of plants by different cultures and religions
Sociology	The study of plant uses in various societies
Systematics	The study of folk-taxonomy, how different people classify plants

Source: Botanical dimensions website

Areas of Ethnobotanical Studies

Archaeoethnobotany is the study of the ethnobotany of identification of the plant materials from archaeological sites for studies on migration of human cultures, and origin, dispersal and domestication of crops etc.

Ethnoecology is the scientific study of the way different groups of people in different locations understand ecosystems around them; the environments in which they live; and their relationship with these.

Ethnomedicine is a sub-field of medical anthropology that deals with the study of traditional medicines – not only those with relevant

written sources (e.g., Traditional Chinese Medicine and Ayurveda), but also those whose knowledge and practices have been orally transmitted over the centuries.

Ethnogynaecology is the study which deals with various diseases among women in tribal societies, related to sterility, conception, abortion, etc., and the use of abortifacients.

Ethnomusicology is defined as "the study and cultural aspects of music and dance in local and global contexts."

Ethnomycology is the study of the historical uses and sociological impact of fungi ("fungi lore"), and can be considered a subfield of ethnobotany or ethnobiology.

Ethnonarcotics is the study of the use of narcotics, snuffs, hallucinogens, etc., in primitive human societies.

Ethnopharmacology is the scientific study correlating ethnic groups, their health, and how it relates to their physical habits and methodology in creating and using medicines. As an amalgamation of the social science of ethology and the medical science of pharmacology, ethnopharmacology studies the pharmacological aspects of a culture's medical treatment as well as its social appeal, including taste, symbology, and religious context. Through this, a culture's exposure to pharmacological substances can be determined.

Ethnotaxonomy refers either to that sub discipline within ethnology which studies the taxonomic systems defined and used by individual ethnic groups, or to the operative individual taxonomy itself, which is the object of the ethnologist's immediate study.

Ethnotoxicology deals with various toxic plants used as fish-poison, arrow-poison, etc., and these studies are mostly concerned with tribal people.

Paleoethnobotany is the archaeological sub-field that studies plant remains from archaeological sites. Major research themes are recovery and identification of plant remains, the use of wild plants, the origins of agriculture and domestication, and the co-evolution of human-plant interactions.

Ethnocosmetics deals with the study of cosmetics of the ancient past which were used by ladies to make their self beautiful.

Ethnolinguistics is a field of linguistic anthropology, which studies the language of a particular ethnic group.

Ethnoorthopaedics is the study which deals with the surgery concerned with acute, chronic, traumatic, and overuse injuries and the other disorders of the musculoskeletal system by different cultures.

Ethnoophthalmology is the study which deals with the ophthalmology (surgery of the visual pathways, i.e. eyes) in primitive human societies.

Ethnopediatrics is the study of parents and infants in our own and different cultures. It explores the way different care-taking styles affect the health, well-being and survival of infants.

Ethnoveterinary medicine (EVM) is the folk beliefs, knowledge, skills, methods and practices relating to the health care of animals. EVM includes medicinal and spiritual aspects, but more commonly taken to mean the use of medicinal plants.

Ethnozoology is the study the complex relationships between people and animals, can include the study of human relationships with and use of domesticated animals, and management of wild animals for hunting and other uses.

Ethnoentomology is the study of relationships between people and insects. This can include studies of useful insects and their products (honeybees, silkworms etc.) and how people interact with and control insect pests.

Indian Ethnobotany

S.K. Jain is known as the Father of Indian Ethnobotany. Vast ethnobotanical knowledge exists in India from ancient time. Jain's notable contribution is a dictionary of Indian folk-medicine and ethnobotany of 2,532 plants. Jain wrote the *Bibliography of Ethnobotany* in 1994 and *The Glimpses of Indian Ethnobotany* in 1981. These two books are regarded as first books related to Indian ethnobotany. Jain was instrumental in describing 24 new taxa.

Organized study of ethnobotany originated in India about four decades ago. During this period, approximately 300 papers or various aspects of ethnobotany have been published in peer-reviewed and indexed journals.

African Ethnobotany

The people of Africa have used indigenous medicinal plants for centuries for survival and optimal health. Plant based medicine is in existence for much longer as compared to Western medicine. The complex interactions and effects from the use of different medicinal plants used in ethnomedicine formulae are in for thousands of years.

The formulae based on ethnomedicine administered by various modes are: typically oral intake of infusions or concoctions (decoctions), steaming, vomiting (emetic therapy), enemas and even smoking. All

these preparations are indicated and reserved for specific health conditions.

Inhalation or steaming of medicines is therapeutically effective for nervous diseases, and have a relaxant action on a person in a rapid manner. The reason being the rapid absorption of the drug through the mucosal membranes of the nose. Treatment protocols like oral intake of medicines like imbizas (cleansing mixtures) are consumed for longer periods (week to months) in order to create balance in the functioning of the digestive system.

African ethnomedicine is often stigmatized by stories of witchcraft. This practice is not followed by authentic traditional healers who want to cure diseases. However, these cultural practices are often used by those who want harm to others and is part and parcel of all cultures just in separate ways. However, healing dynamics involved in the use of traditional medicine formulae in order to create harmony of the functions of the body and mind are less known and documented.

Traditional medicine has played significant role in alleviating malaria symptoms like pyrexia, vomiting, and diarrhoea. *Momordica balsamina* L. (Cucurbitaceae) needs special reference as it is highly reputed to cure vomiting apparently associated with bilious fever. *Rauvolfia caffra* Sond. (Apocynaceae) is the source of alkaloid, reserpine, used as anti-hypertensive agent. This plant is also used in the treatment of malaria.

Zuni Ethnobotany

Zuni Ethnobotany stands for medical ethnobotany of the Zuni Indians of west-central New Mexico. Historically, these people were hunters and gatherers, and later, farmers and sheep herders.

Mexican Ethnobotany

The Mexican government established a national pharmaceutical industry in order to utilize the valuable heritage of traditional practices coupled with European medical concepts and resources. In 1975, the Mexican Institute for the Study of Medicinal Plants came into existence aimed at integration of botanical, chemical and pharmacological studies on the Mexican flora. The institute played a pivotal role in the compilation of a database of ethnobotanical information related to Mexican medicinal plants from the ancient and medical literature of the 16th-19th centuries. A second database was based on current use of medicinal plants. Further, a medicinal herbarium was created. A core group of 1000 plants used in traditional medicine throughout Mexico for almost 400 years was identified. Screening utilizes collaboration between phytochemists and pharmacologists. The plant extracts are assayed and fractionated until the isolation of pure compound results.

European Folk Medicine

European folk medicine holds special fascination for anthropologists, ethnobiologists and ethnographers alike. European folk medicine has roots in ancient Greek, Roman, and Arabic medical theories. The folk knowledge has been passed down generation to generation by written as well as oral modes over the centuries. Some of the medical traditions have survived the passage of time relatively intact. Some medical traditions have either changed or disappeared, whereas “novel” remedies and usage of plants have emerged.

Bhutanese Traditional Medicine

The Bhutanese traditional medicine has evolved out of Tibetan medicine. The pharmacopoeia, ethnopharmacology, ethnobotany and the ethnoquality aspects shares commonalities with the mainstream Tibetan medicine. Some practices are unique to Bhutanese traditional medicine like current practices of Bhutanese traditional medicine includes traditional formulations, collection and use of medicinal plants, and above all, the inclusion of golden needle and water therapy in treatment procedures.

Saami Folk Medicine

The Saami are the indigenous people of northern Sweden, Norway, Finland and the Kola Peninsula. Medicine from animals came largely from bear and reindeer. They use 120 medicinal plants in folk formulae. The dried angelica root is called “urtas” in Lule Saami.

Ozarkian and Haitian Folk Medicine

There exists a similarity between Haiti and midwestern America Herbalism as far as collection and usage of herbs are concerned. Ozark people enjoy better access to doctors and hospitals as compared to Haitians. Sarsaparilla, catmint and mints (peppermint, spearmint, lemonmint and horsemint) are some common herbs used in practice. Senna is used as efficacious febrifuge. Vervain is widely used in female diseases.

Georgian Traditional Medicine

Georgian traditional medicine comprises ancient written classical documents and folk medicine. More than 500 manuscripts from the 10th to the 19th century have been found and described in Georgia and elsewhere.

Sardinian Folk Medicine

Sardinia is a territory with one of the greatest floristic diversity in the Mediterranean area in Italy. In Sardinia, there is a folk pharmacopoeia that includes a large number of endemic species, and that the number of pathologies that are still treated with natural active ingredients is also large. The use of *Scrophularia trifoliata* L. for Basedow's disease and *Vinca sardoa* (Stearn) Pign. against tuberculosis is noteworthy.

Traditional Pharmacopoeia of Vulture-Alto Bradano, Inland Southern Italy

The traditional dermatological pharmacopoeia of Vulture-Alto Bradano has roots in folk remedies including, based natural and spiritual illness and healing. These remedies find use in the treatment of 45 skin and soft tissue diseases in humans as well as animals. *Malva sylvestris* (Malvaceae), *Marrubium vulgare* (Lamiaceae) and *Matricaria recutita* (Asteraceae) are commonly used herbal remedies.

Traditional Iberian Pharmacopoeia

The Iberian Peninsula can be considered a small continent of around 600,000 sq. km. It is separated from the rest of Europe by the Pyrenees, a mountainous barrier that has contributed to its relative isolation. The rich traditional lore of the Iberian Peninsula has attracted many folklorists, ethnographers, and medical anthropologists and ethnobotanists since the end of the nineteenth century. According to a recent review of medicinal plants popularly used in Spain, the number of species employed is around 1,200, more than 15% of the Iberian flora.

Izoceño-guaraní Ethnomedicine and Pharmacopoeia

Izoceño-guaraní people belong to the extended Chiriguano group. They are actually organized in independent communities, settled down in Southeast Bolivia. Medicine is in the hands of PAYE who are recognized as specialists in their own group. Ethnopharmacological research throws light on over 306 species, 189 of them having medicinal uses. Animal products are also part of treatment in addition to plants.

Hausa Herbal Pharmacopoeia

Hausa practitioners practice a system of herbal medicine in Hausa (Northern Nigeria). Biomedical evaluation has proven efficacy of herbs mentioned in Hausa herbal pharmacopoeia for the treatment of malaria.

Bir Pharmacopoeia and other from Nepal

Bir Nighantu is also referred to as *Bir pharmacopoeia* and is a hand written herbal encyclopedia. The credit of compilation of *Bir Nighantu* goes to Pandit Ghana Nath Devkota under the instruction of Bir Samser, the former prime minister of Nepal (1885–1901 AD). Kosh Nath Devkota wrote an elaborated account which is found in *Nepali Nighantu*, published by the Royal Nepal Academy in the year 1969. *Nepali Nighantu* provides information on 750 medicinal plants. Most probably, *Nepali Nighantu* is the pioneer written effort towards targeted at compilation of the traditional knowledge about medicinal plants of Nepal.

The Badianus Codex

It is known as ‘The Little Book of Herbs’. It was composed in 1552 at a college of Santa Cruz by Aztec Physician Marin de la Cruz. Painting of the plants is the salient feature. It contains information on 251 plant species. Ohuaxocoyolin was the drug used to treat glaucoma. It is considered to *Begonia* species.

Socioethnobotany

The study of the social aspects of the use of plants – motivated by a desire to understand how to best compensate the societies from which information about plant uses was obtained.

Shaman Pharmaceuticals

“Shaman Pharmaceuticals, Inc. is a South San Francisco-based pharmaceutical company that focuses on isolating bioactive compounds from tropical plants that have a history of medicinal use. Shaman is working to promote the conservation of tropical forests and bridge the gap between the biomedical needs of both indigenous cultures and the rest of the global population.

Eschewing the mass screening approach typically done by many pharmaceutical companies, Shaman has pioneered a novel approach to drug discovery, integrating traditional plant natural products chemistry, the science of ethnobotany, medicine, and medicinal chemistry while maintaining a commitment of reciprocity to the indigenous cultures. A typical Shaman research model has been represented in Fig 2.

Ethnobotanical Inventory

Ethnobotanists are increasingly finding themselves as advisers in resource management. This makes it important for their recommendations to be well founded in order to avoid overharvesting of the plants in question. Quantitative methods are key in the provision

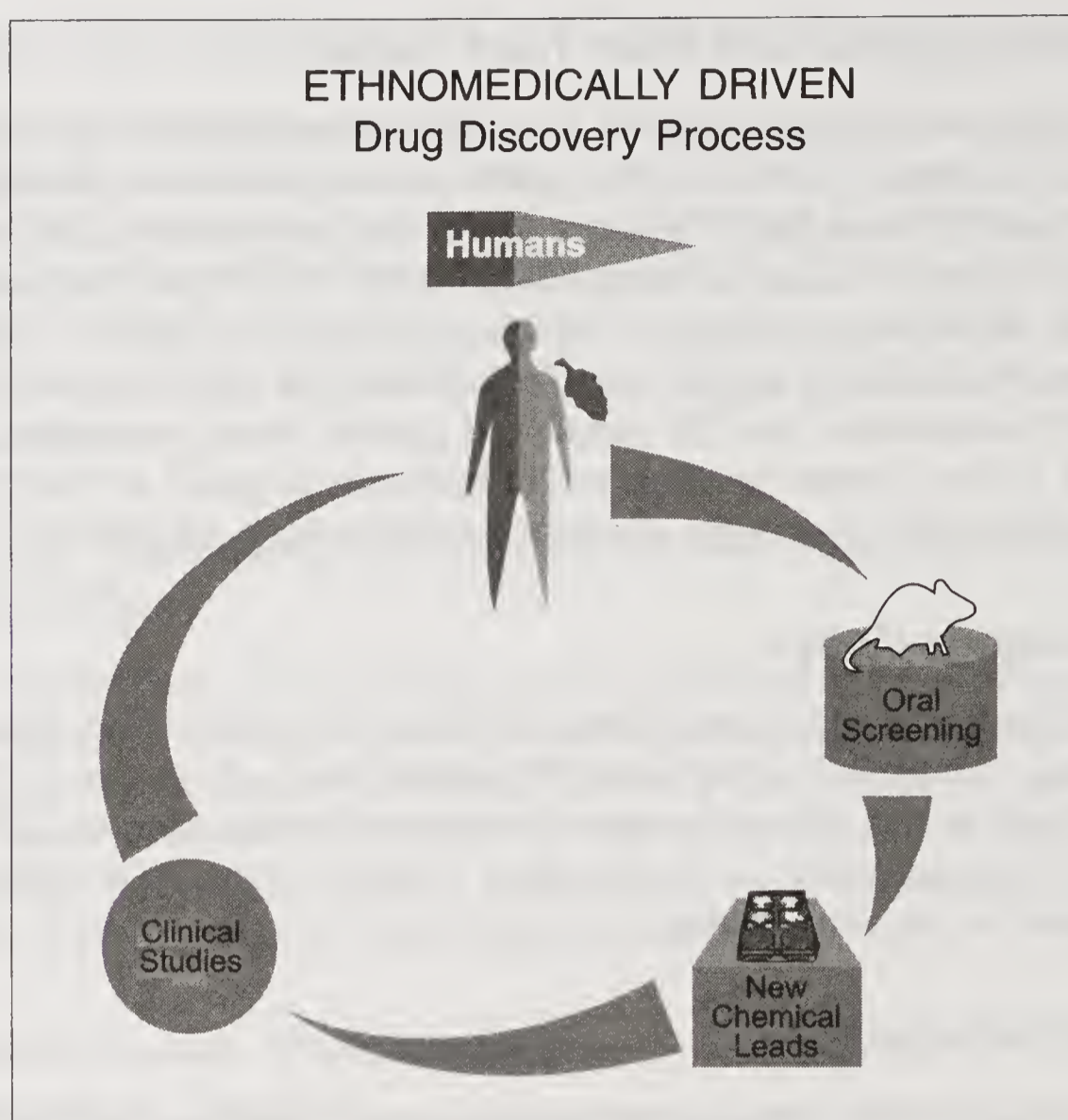


Fig. 2. Schematic representation of a typical Shaman research model

Source: <http://courses.knox.edu/bio320/Socioethnobotany.ppt>

of the best management advice. Consequently, ethnobotany is in an evolutionary state - moving from being a classical, purely descriptive method to a more quantifiable science as it acquires some of the methodologies. Table 2 highlights some of the key differences between the old and the new.

Quantitative Ethnobotany and NWFP Inventory

Despite lacking a sound biometric basis, quantitative ethnobotany has been used in NWFP resource assessment. Key methods involve relative use values - for species and for the forest as a whole.

Several species use value methodologies have been developed (Table 3). This approach is promising, as it is both quantitative and focuses on the plants, but has its problems:

1. Data are collected in a single day, providing a snapshot of local priorities, which might be different on another day through mood or seasonal changes. Repeating the collection on different days/seasons would help to minimize error, as would ensure that there were adequate numbers of informants.

Table 2. Changing methods in ethnobotany

	Classical ethnobotanical inventory	Quantitative ethnobotany
Main thrust	Typically, ethnobotanical inventory has prepared lists of plant species used by different ethnic groups. Scientific names of plants is the main priority	Transforms the traditional local knowledge into quantifiable relative use values
Advantages for NWFP*inventory	The lists may provide a useful overview of the plants used by a local community	Quantification means that: <ul style="list-style-type: none">• Studies can be replicated - two different researchers would get the same result• It allows statistical hypothesis testing of how significant given plants are to local people It is not biometrically rigorous as there are: <ul style="list-style-type: none">• No formal sampling (systematic plot selection is time-consuming and expensive)
Drawbacks	There is rarely any quantitative information on the level of use or abundance, with no indication of relative importance to the society Data sources may be very varied, making comparisons and verification difficult. Take more time than is usually available for NWFP inventory and assessments within development projects	<ul style="list-style-type: none">• No or few replicates (often 1 plot per site)• No statistical compilation or analysis of data collected• Requires familiarity with biometric sampling techniques and their theoretical bases to provide statistical rigor
Developments needed	There is limited progress with the development of techniques for rapid assessments	Greater use of biometric sampling, where management recommendations are required, e.g. for extractive reserves or protected/conservation areas

* NWFP=Non-wood forest products

Source: Food and Agriculture Organization of the United Nations, Further ethnobotany reading: Alexiades (1996); Cotton (1996); Martin (1994); Given and Harris (1994). Reproduced with permission.

2. It assumes that a plant with several uses (e.g. a plant used occasionally for several illnesses) is more valuable than one with a single use (e.g. a staple food), as it ignores frequency and amount collected.
3. It might also miss NWFPs which are important to only a few members of the community.

Table 3. Methods for quantifying species use values

Method	Data required	Calculations
Subjective allocation	Several types of interview technique and/or direct observation	The relative importance of each use is subjectively assigned by the researcher on the basis of his or her assessment of the cultural significance of each plant or use
Informant consensus	Independent interviews of individual informants	The importance of each use calculated directly from the degree of consensus in informants responses
Uses totalled	Interviews, sometimes by direct observation	Number of uses summed by category of plant use, taxon or vegetation type. Not very good because, all uses given equal weights and total number of users may be a function of research effort rather than the true significance of plant, vegetation type, etc.

Source: Food and Agriculture Organization of the United Nations, After Phillips (1996). Reproduced with permission

Use-Value and Relative Importance Techniques in Ethnobotany

Measurement of the importance of plants and vegetation to the people is a central theme in quantitative ethnobotany. Relative cultural importance (RCI) indices such as the “use values” developed by Prance *et al.* (1987) and Phillips and Gentry (1993a, 1993b) are applied in ethnobotany to calculate a value per folk or biological plant taxon. The application of RCI indices in ethnobotany began during the late 1980s. With diverse applications and keen interest among researchers, RCI indices are set to remain as key research tools in ethnobotany.

Bayesian Approach

The Bayesian approach is a novel method that allows the comparison of medicinal flora with the overall flora of a given area in order to investigate over- and under-used plant families. The Bayesian approach in comparison to regression analysis and binomial method considers the inherent uncertainty around the analyzed data.

Weckerle *et al.* (2011) evaluated quantitative methods in ethnobotany and ethnopharmacology based on Bayesian approach. Compilation was done on medicinal flora with 423 species based on 9 studies on local medicinal plant use in Campania. The total flora comprises 2237 species belonging to 128 families. Statistical analysis was performed by the Bayesian method and the binomial method. An approximated χ^2 -test was used to analyze the relationship between use categories and higher taxonomic groups.

Lamiaceae (Labiatae), Rosaceae and Malvaceae were found to have over-use in the local healthcare system of Campania, whereas Caryophyllaceae, Orchidaceae, Fabaceae (Leguminosae) and Poaceae (Gramineae) were found to be under-used in comparison to rest of the flora. Noteworthy feature was a correlation of medicinal uses with taxonomic plant groups. As an instance, predominant use of monocots in the treatment of genitourinary diseases.

What is Ethnobotany Today?

Emphasis is placed on the interdisciplinary nature of the subject and progress is made when botanists, anthropologists, ecologists, chemists, etc. work in close collaboration. Ethnoecology, the study of the management systems of indigenous people, is particularly important for its application to the creation of sustainable use systems in the tropics. This must include the study of peasant agriculturists who have adapted many techniques from cultures that have long been extinct.

Quantitative studies of the extent to which rainforest Indians use the forest have provided many data useful for conservation. The study of indigenous medicines is leading to the discovery of new medicines and agrochemicals. When commercial benefit is gained from products derived from information obtained from indigenous people, it is essential to ensure that they and their countries benefit from the royalties. There is a great urgency for further ethnobotanical research before indigenous cultures and natural habitats are destroyed.

Ethnobotanical Approaches of Traditional Medicine Studies in Asian countries

Ethnobotany has wide and important application in documentation of indigenous knowledge on the usage of plants for medicinal purpose. It also provides an inventory of economic plants from local flora of countries of Asian origin. Plants that have a role in traditional medicine in different Asian countries are an important part of the ethnobotanical study. However, in some countries the role of ethnobotanical studies has been revised recently. These studies are largely used for the discovery of novel drugs and novel drug development. It can be said without doubt that ethnobotanical studies in China and Himalayan countries have resulted in drug production as well as novel drug development. On the other side, over-harvesting, degradation of medicinal plants, and loss of ethnomedicinal knowledge in local communities are serious and common obstacles in these resource areas. Issues related to indigenous knowledge, intellectual property rights (IPR), and uncontrolled transboundary trade in medicinal plants are frequent in the region.

Field Methods in Medical Ethnobiology

What is medical ethnobiology?

Medical ethnobiology is the multidisciplinary scientific study of the

- Folk knowledge, and
- Cultural practices embodied in traditional medical systems with emphasis on the natural resources used in the maintenance and restoration of human health.

Research in medical ethnobiology comprised three major components:

- Ethnomedicine
- Medical ethnobotany, and
- Ethnopharmacology

Prior informed consent to conduct the study

Prior informed consent must be obtained from the communities in which the research is to be conducted. Ideally, funding agencies should award at least 1 year of support for the informed consent process.

Training local research assistants

1. A comprehensive research programme has a cadre of trained field assistants. Some of the most important skills that local research assistants must acquire include:
 - Core field linguistic methods, especially accurate linguistic transcription
 - Interviewing skills, and
 - Native language questionnaire production and testing
2. Botanical, ethnobotanical, and ethnoecological data collection and recording methods, including:
 - The use of global positioning system instruments,
 - Map reading,
 - Map production, and
 - Basic photography
3. Herbarium processing and curation procedures;
4. Basic computer literacy including word processing and database management; and
5. Elementary biological laboratory techniques, regulations, and precautions.

Ethnomedicinal data collection

- A preliminary understanding of folk concepts of anatomy and physiology is essential.
- Have collaborators who can produce their own drawings of the human body.

Ethnomedical explanatory models of illness

1. Survey instruments must be translated and back translated in the local language.
2. Ethnomedical explanatory models of recognized health conditions consist of:
 - Ultimate cause: Why did you get sick?
 - Proximate cause: a series of contributory or risk factors
 - Onset: Is the onset rapid or gradual?
 - Signs: How does it look, feel, or smell to persons other than the patient?
 - Symptoms: What are the sensations and indicators that the patient perceives?
 - Normal course: What is the normal progression of the condition, if left untreated?
 - Complications: Does the condition sometimes worsen and perhaps transform into another condition?
 - Prognosis: What is the expected outcome of this condition?
 - Ecology: Is it associated with the conditions of the biological environment or psychosocial environment?
 - Special groups affected: Who gets it (age, gender, ethnicity)?
 - Treatment: How can it be made better or cured?
 - Healing resources: Who can treat or cure it?
 - Special precautions during treatment
 - Special dietary restrictions
 - Behavioral restrictions

Clinical data (Ethno-epidemiology survey and medical ethnobotany)

- Secure local, national, and international collecting permits
- Make arrangements with collaborating botanists
- Produce botanical voucher specimens that conform to the highest standards

The following ethnobotanical information is relevant:

- Local name(s) of the plant

- Health condition(s) that the plant is said to treat
- Plant part(s) employed
- Other plants or substances used as admixtures
- Specialized collection requirements (e.g., time of day or night, season)
- Complete methods of preparation
- Complete modes of administration
- Quantities (based on a native system of measurement) of all ingredients used)
- Dosage (with special consideration for age, gender, health condition of patient)
- Presumed curative principles of each constituent
- Desired effect produced by each ingredient
- Duration of treatment, and
- Dietary constraints, restrictions on regular activity?

This ethnomedical data can guide pharmacological laboratory analysis for biological activity. The discovery of novel compounds could lead to the development of new pharmaceuticals. The use of herbal remedies that are safe and efficacious can be promoted in place of expensive patent or over-the-counter medicines. Pharmacologically effective medicinal plants can be produced in home gardens and community plots

The nutshell of the above discussion is represented diagrammatically in Fig. 3.

Herbarium specimen

Herbarium specimens are very important for botanists as they provide a scientific record of a plant collection for a long-term basis. The plant specimens are collected by the botanists for the purpose of identification of the species observed in the field. Less attention is paid to the local and folk names of the plants. Anthropological studies are used for documentation of the local and folk names of the plants, however botanical identification is missed out.

As the major concern of ethnobotanist is with the usage of the plants across the cultures, it is absolutely important for creation of linkage between the folk name of the plant documented with the scientific name. In fulfilling this purpose, ethnobotanists do collection of plant specimens along with their name and use. This is followed by drying of the plant specimens and transportation to a herbarium. Identification is carried out by taxonomists, mounted on the paper sheets and followed by storage in special drawers.

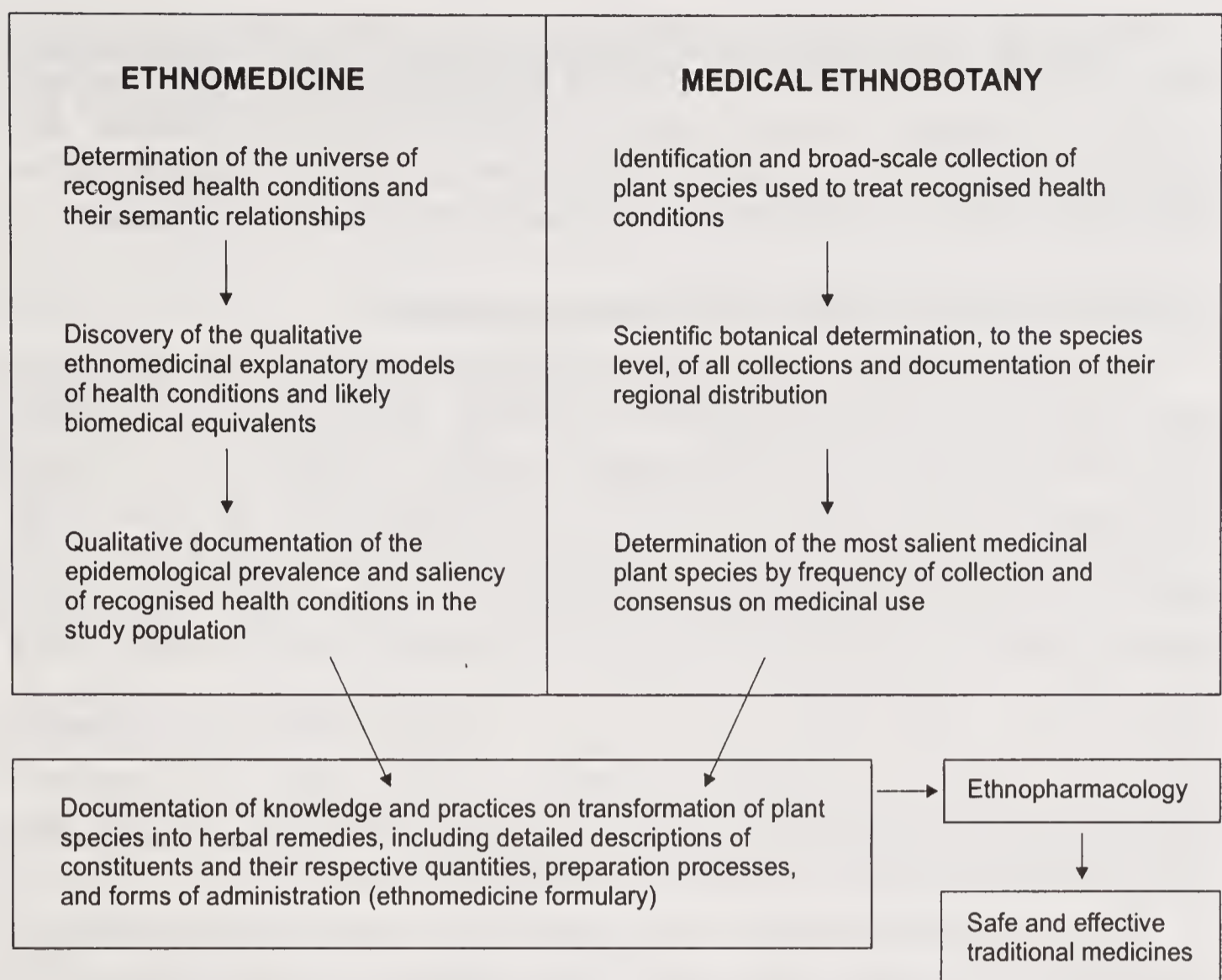


Fig 3. Flowchart of medical ethnobiological research

Source: Berlin and Berlin., Field Methods.2005; 17: 235-268.

The process of preparation of herbarium specimens is divided into three stages:

1. Collection of the plant material in the field
2. Drying and pressing the plant specimens, and
3. Botanical identification of the species and mounting the specimens.

1. Collection of the plant material

While collecting the plant specimen for herbarium purpose, it is absolutely necessary to collect the fertile material (flower and fruit) as they are highly useful for identification purpose. Caution should be exercised to collect leaves as they are useful for identification purpose. If herbaceous plants are collected, roots should be collected along with the specimens. If several small plants are available, they can be included on one herbarium sheet.

Other species can be adjusted by bending the stem once or twice. When herbaceous or woody specimen is in question, representative part of the plant (leaf) should be chosen. It is advisable to collect bark also as it may give clues to identification. Notes on the ecological habitat of

the plant and characteristic features like colour and smell (organoleptic testing) should be noted as they tend to change during pressing and drying. The collector should include notes on habitat, abundance, and distribution patterns. A unique ID number should be assigned to the specimen. Taking a photograph of the collected plant is advisable.

2. Drying and pressing herbarium specimens

Adsorbent papers, corrugated cardboards, newspaper, source of heat, straps and a plant press are required by the researcher to prepare the herbarium. The collected plant material is placed in a folded newspaper sheet, taking care that no overlapping among plant parts occurs. If overlapping occurs, some plant material should be cut. If leaves are to be removed, petioles should be left so that information regarding the arrangement of leaves is not missed out. It is essential that both surfaces of the leaves should be displayed as it is helpful in identification of the plant at later stages. If thick fruits are in question, they can be sliced to minimise growth of slime mold. An absorbent paper is used on both sides of folded newspaper. Similarly, on each side of the absorbent paper, corrugated cardboard is used.

When several units have been piled up, a stack (abstract data) is available to the plants. The units that compose the stack should be rearranged. The stack should be pressed by means of a plant press (two rigid frames constituted of wood and straps). The frames are put on both ends of the stack and bound with straps. The straps should be pulled tight so as to get better pressing and drying of the plant.

3. Botanical identification of the species and mounting the specimens

Botanical identification is done with the help of dichotomous taxonomic keys and by comparing with other specimens held in the herbarium. Collaboration with taxonomists is must in order to carry out the botanical identification in an effective manner.

The specimens should be mounted on special paper with glue, by sewing them, or with the help of special tape. A well-mounted plant fits the sheet well while leaving ample space for a standard label. Overlapping of plant parts should be avoided.

Once the identification of plant species has been done, labels are prepared and specimens mounted. The labels contain information on date and place of collection of the plant specimen, family and the name of the collector. Above all, a unique collection number is necessary. Ethnobotanical data of the plant should focus only on those points observed during collection.

Ethnobotany and Drug Discovery: the Experience of the US National Cancer Institute

The National Cancer Institute is abbreviated as NCI. It was instrumental in screening 114,000 extracts derived out of 35,000 plants. Since 1986, NCI is focusing collection of plants from tropical and sub-tropical regions. However, priority is given to those medicinal plants where satisfactory information is available. Since August 1993, 21,881 extracts originating from 10,500 samples have been tested with a screen for anti HIV activity and 2320 extracts are of herbal origin. Nearly 18% of the herbal extracts demonstrated anti HIV activity and 90 % of the extracts were of water-origin. Polysaccharides or tannins were estimated as active ingredients of these extracts. Twenty four plant derived compounds were screened on the basis of ethnobotanical basis.

Ethnobotany Genomics

Ethnobotany genomics is a new approach to lead botanical discoveries and innovations from botanical sources in era of super-specialty research. The concept ethnobotany genomics have roots in 'assemblage' of biodiversity knowledge, which includes blending of both traditional knowledge and scientific knowledge. Ethnobotany genomics utilize modern analytical tools that can be used to overcome taxonomic impediments in order to explore biodiversity. DNA barcoding is important as well as a critical technique used in biodiversity genomics. Although the problems associated with plant barcoding have been highlighted, detailed studies have demonstrated the usefulness of barcoding as an effective tool for plant identification.

Coupling Ethnobotany and Chemical Ecology for Drug Discovery

The hypotheses from the coupling of ethnobotany and chemical ecology shall be helpful in increasing the scientific ability to explore the pharmaceutical potential of the tropical plants. Bioprospecting studies can take advantage of coupling of ethnobotany and chemical ecology for exploring the ecology of plant defense against herbivory. As per evidence, medicinal plants growing in the dry forests accumulate a good amount of phenolics, especially tannins, which are responsible for the therapeutic activity. Thereby, these phenolic compounds and their potential pharmacological activities can be good candidates for bioprospecting efforts.



2

Man and Biological Resource of Earth with Respect to Plants

What is Biodiversity?

Biodiversity is also known as biological diversity. It is a term used for describing the variety of living-beings on our planet, earth. In other words, biodiversity represents the degree of variation of life. The spectrum of biological diversity includes microorganisms, plants, animals and ecosystems (coral reefs, forests, rainforests, and deserts).

There are three divisions of biodiversity (Fig 4).

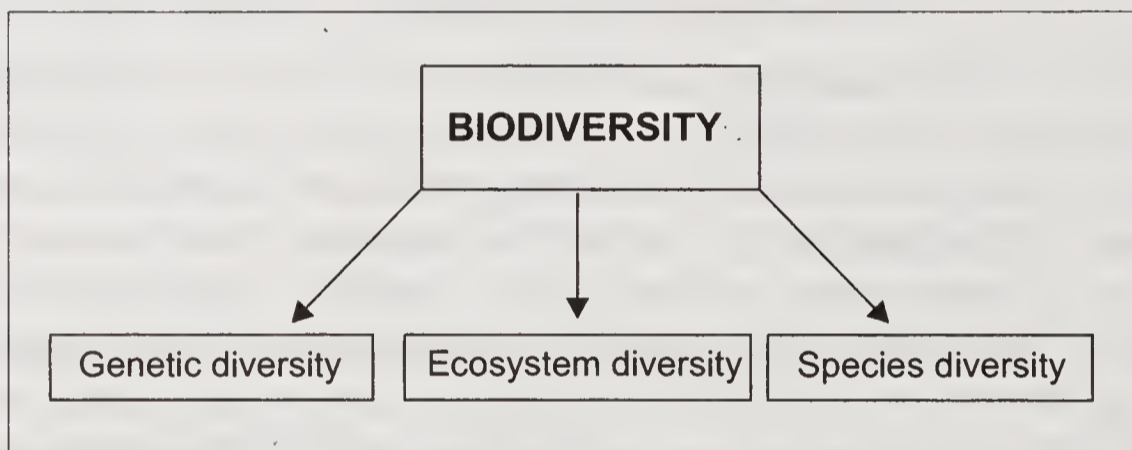


Fig 4. Essential components of biodiversity

Significance of Biodiversity

Biodiversity has great significance as far as functions on the earth are concerned. These are narrated below:

1. Maintaining the ecosystem equilibrium:
 - Combating pollution
 - Formation and protection of soil
 - Maintenance of ecosystem equilibrium
 - Protection of water resources
 - Recycling and storage of nutrients
 - Stabilization of climate
2. Provision of biological resources:
 - Source of medicines and pharmaceuticals
 - A source of food for humans and animals

- Source of ornamental plants
- Source of wood products
- Source of breeding stock and species diversity
- Source of ecosystems and genetic resources

Natural Resources

The natural resources are represented in the following diagram (Fig 5).

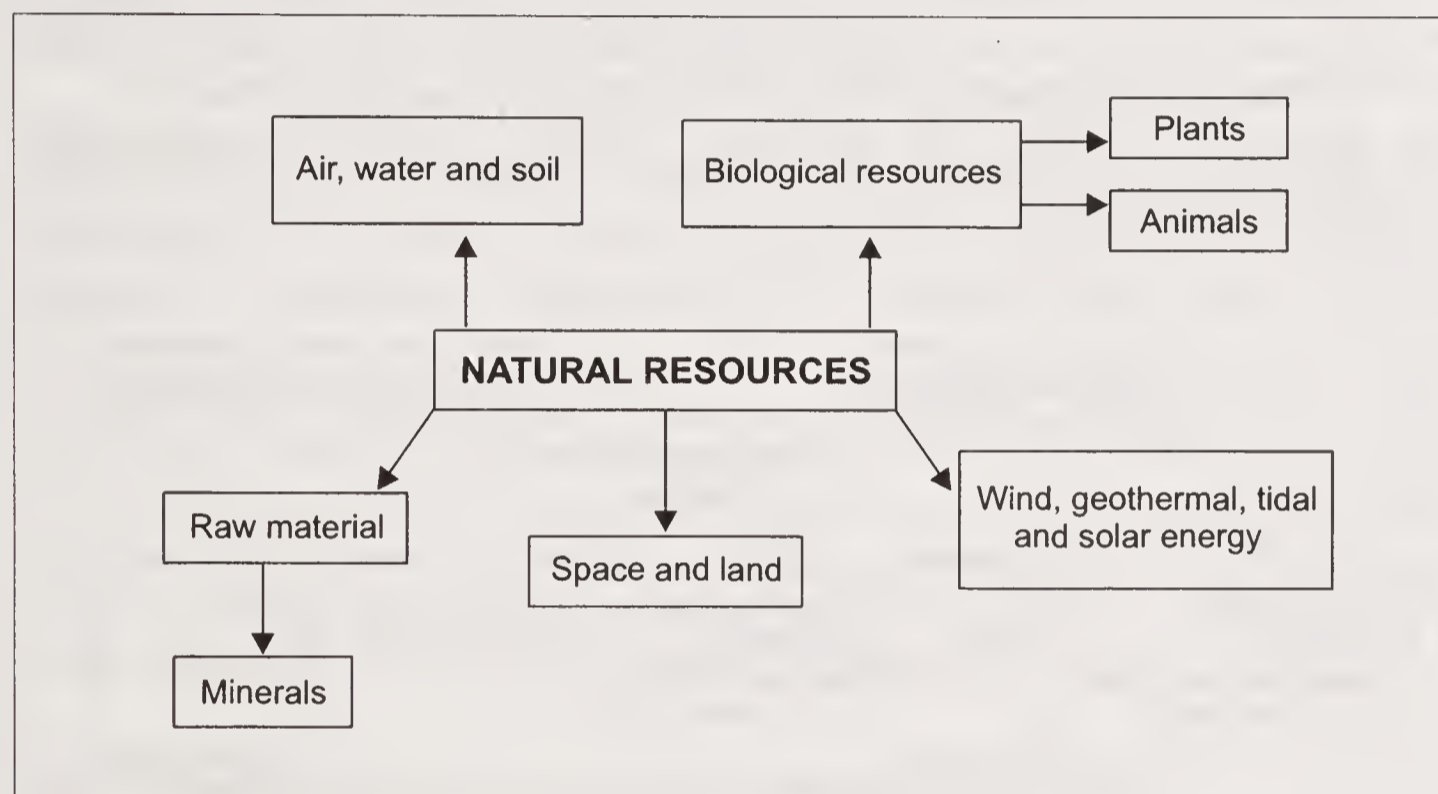


Fig 5. Natural resources

Natural resources are classified into renewable, flow, and non-renewable resources.

Renewable Resources

Renewable resources are in living state and are in a position to renew themselves, if they are not eliminated or over-harvested. Typical examples of renewable sources from plants include trees (forests and woodlands) crops, and fish from animals. Water and soil are among renewable sources, but are classified as non-living.

Flow Resources

Flow renewable resources include the tides, solar power and the wind. These are all renewable but there is no requirement of regeneration or re-growth.

Non-renewable Resources

Non-renewable resources include the ones that cannot be replaced

once they are used up or harvested. Examples include coal, fossil-fuels, and petroleum.

Biological Resources

Biological resources refer to the plants, animals, and other aspects of nature. Biological resources are associated with the various services they provide to the society. They have a crucial link with the problems they create (Fig. 6). Biological resources are grouped into:

- Those that affects agriculture (cultivated plants, pollinators, and pests)
- Those that are sources of scientific inputs (agricultural plant varieties and their wild relatives) that provide genetic resources, and
- Those that provide natural goods and services, such as wildlife, fish, and scenic beauty.

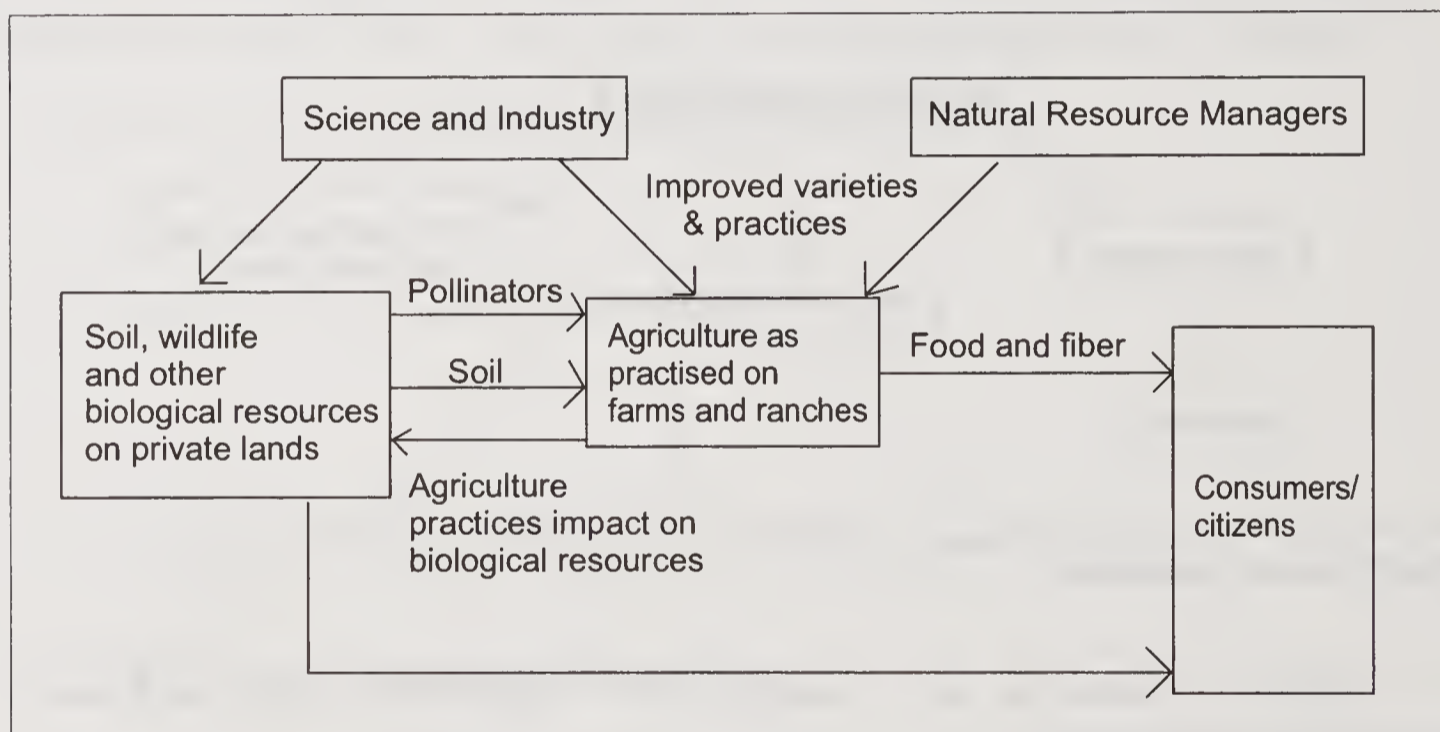


Fig 6. Biological resources, agriculture, and society

Source: United States Department of Agriculture Economic Research Service
Agricultural Resources and Environmental Indicators, Chapter 3.1.

Resources that Affect Agriculture

Resources that affect agriculture include cultivated plants, pollinators, pests, and pest predators. A few biological resources have a direct impact on agriculture. As an instance, agricultural-cultivars, soil-microbes and domesticated animals form the foundation of agriculture. These resources make a significant contribution to the quantitative and qualitative aspects of production of food and fiber. A few biological resources have a less direct effect on agriculture. For instance, the density of noxious weeds on nearby lands drastically decreases profitability of a farm. The reason behind is the frequent use of expensive weed control measures that increases economic burden on the farmers.

Agricultural practices of traditional mode are not fully capable to preserve the biological resources on private lands. Due to this factor, private landowners do not have adequate incentives to take into consideration the services and goods provided by the biological controls under their supervision. Further, it may not be a profitable business for the farmers to adopt measures that provide the quantitative and qualitative aspects of wildlife-habitat and the genetic diversity as desired by the masses. Similarly, farmers may not consider the full spectrum of indirect benefits when they make land use decisions.

Resources that provide scientific inputs

Resources that provide scientific inputs include native plants and animals, providing genetic resources for plant breeding and biotechnology. The natural world is a significant source of biological information, in terms of macro-structure (ecology) as well as micro-structure (genetics). Preservation of natural landscapes (*in situ* protection) has a protective effect on the genetic resources and evolutionary processes existing in the nature. Alternatively, other resources, having economic importance, are conserved in gene banks, which acts as a source of diverse genetic resources (*ex situ* protection). On the whole, these approaches protect plants as well as animals, and help in preserving material that may prove useful in the production of new industrial and pharmaceutical products in the long-run.

Resources that generate natural goods and services

Resources that generate natural goods and services include wildlife, fish, and scenic beauty present in farmed and natural landscapes. People enjoy a rural landscape's biological resources, particularly the animals and plants that comprise a natural community.

National Register of Medicinal Plants

Conservation of natural resources and their sustainable use have been the main theme of IUCN since its establishment in the year 1948. IUCN supports the cause of the fair and equitable sharing of benefits arising out as a result of the utilisation of genetic resources. Medicinal and aromatic plants (MAPs) of the Himalayan region are prized since time immemorial. Further, the indigenous knowledge coupled with the traditional usage of the medicinal plants requires special attention to ensure the equitable sharing of the benefits arising from the utilisation of such knowledge, innovations and practices.

In this light of development, it becomes absolutely necessary for the national governments to prepare national registers and inventories of the important components of biological diversity, among them, medicinal and aromatic plants can be considered as priority component.

The National Register of Medicinal and Aromatic Plants (NRMAP)

The National Register of Medicinal and Aromatic Plants (NRMAP) was put together in the year 2000 by the Government of Nepal in building up a national register of biological diversity. NRMAP provided a format to integrate taxonomic information with details of medicinal properties and uses documented in Nepal's Ayurvedic texts and ethnobotanical literature. Nepal's wealth of Medicinal and Aromatic Plant species has been estimated at 700 to 1,600 species based on various sources of information. The NRMAP included 150 species of medicinal/aromatic plants as an initial step to encourage further work in the national registration process.



3

Ethnic People – Contribution in Ethnobotanical Knowledge

Indigenous and Ethnic People

With the passage of time, the people of indigenous and ethnic communities have learnt to live in hostile atmospheres of the earth. The outstanding feature of the people of these communities is a close association with the biodiversity. As per one estimate, about 300 million indigenous people live in this world. 150 million people are part of Asia and about 30 million are part of Central America, South America, Australia, Europe and Russia. Ethnic and indigenous people of the World are tabulated below (Table 4).

Table 4. Ethnic and indigenous people of the World

Country	Indigenous tribe
Australia	Aborigines
ArticEskimos	Eskimos
Bangladesh	Hill Tribes
Brazil	Apinaye Indians
Botswana	Bushmen San
Central Africa	Bororo People
Western Africa	Pygmy Culture
Costa Rica	Red Indians
Colombia	Kogi, Paez and Guambiano Indians
Chile	Mapuche Indians
Ecuador	Amerindians
Greenland	Eskimos
Guatemala	Moyan Indians
India	Scheduled Tribe
Indonesia	Kenyah
Mexico	Kanak People
Malaysia	Kayan, Kenrah and Punah
Mali	Tuares Nomad
Nicaragua	Miskito Indians
New Zealand	Maoris
New Caledonia	Kanak People

Contd...

Table 4. Concluded

Country	Indigenous tribe
Namibia	Bushmen San
Niger	Tuanag Nomad
Kenya	Maasai and Samburu people
Philippines	Manobo, Bangsa and Moro people
Peru	Yagua Indians and Amuesha Indians
Paraguay	Ache Indians
Panama	Guaymi Indians and Kume Indians
Spain	Canib Indians
Sweden	Lapps
Thailand	Karan People

Source: Anon ⁸ ("Atlas of Environment" (1992), WWF, Oxford Publication, Oxford, London)

As far as India is concerned, 68 million people belonging to 227 ethnic groups, comprising 573 tribal communities are known to exist. It is believed that the origin of these communities is in six racial people (Negroid, Proto- Australoid, Mongoloid, Mediterranean, West Breachy and Nordic). These people mostly living in tribal areas are in close relation with the forests and have played significant role in the conservation of local biodiversity and ecosystems. The tribal people consume wild edible plants either in raw or cooked form. These people also utilize products of forest origin like fuel wood and forest timber.

India is blessed with large ethnic society and biodiversity. Out of 45,000 species of wild plants, 9,500 have ethnobotanical importance. Of these 9,500 species, 7,500 are utilized for medicinal purpose for indigenous health care systems. About 3,900 plant species are used by tribals as food, 525 species are used for fiber, 400 species are used as fodder, 300 species are used in the preparation and extraction of chemicals which are used as naturally occurring insecticides and pesticides, and 400 species are used for extraction of gum, resins, dyes and perfume (Table 5).

Table 5. Wild plants used ethnobotanically by the Tribes of India

Use of wild plants	Number of species used
Food	3,900
Medicinal herbs	7,500
Fodder	400
Fiber and cordage	525
Pesticides and piscicides	300
Gums, resins and dyes	300
Incense and perfumes	100
Miscellaneous	700

Source: Government of India, Ministry of Environment and Forest, 1994

The Role of Ethnic and Indigenous People in Conservation of Biodiversity

Plants conserved and worshipped by tribal people

Many plants have been conserved in their natural habitat by tribal people as per magico -religious beliefs. The tribal people are of the view that these plants are the habitat of god and goddess. The tribal culture existing in tribal pockets in Central India has been recorded in Dindori, Balaghat and Mandala districts of Madhya Pradesh and Kawardha and Bilaspur districts of Chhatisgarh states. A list of such plants includes *Aegle marmelos*, *Azadirachta indica*, *Calotropis gigantea*, *Citrus medica*, *Mangifera indica*, *Nelumbium nucifera*, *Nerium indicum*, *Ocimum santum*, *Sesbania grandiflora* and *Terminalia arjuna*.

Plants conserved and used as food by tribal people

The ethnic and indigenous people have played instrumental role in conservation of several plants and endangered cultivars of agricultural crops having origin under diverse agro-ecological climates in north-east, central and peninsular region of India. The indigenous cultivars of rice (Champara, Pattambi and Valsana) are conserved by Kurichya, Pariyar, Khasi, Jatin and Garo tribes in the North East region of India. 150 wild cultivars of rice are conserved by Santhal, Munda, Birhor and Gond tribes of Madhya Pradesh, Chhatisgarh, Orissa, Jharkhand and Bihar.

The Kani, Karuman and the Kurumba tribes of Kerala state grow 26 different traditional varieties of rice, which are obsolete from modern agricultural practices. The Gaddis in the Himalayas uses a wide range of wild plant species for food purpose. The tribals of Northeast India grow pseudo-cereals like *Amaranthus* and buckwheat on a large scale.

Plants conserved by tribal people for edible use

The plant part used for edible purpose may be fruits, seeds, bulbs, roots and tubers. Some common examples are *Aegle marmelos*, *Amorphophallus paenonflodium*, *Achyranthes aspera*, *Bauhinia purpurea*, *Curculigo orchioides*, *Dioscorea alata*, *Dioscorea bulbifera*, *Entada pursaetha* and *Xylia xylocarpa*.

Plants conserved by tribal people for an antidote to animal poisoning

Paste of *Achyranthes aspera*, *Acorus calamus*, *Bombax ceiba*, *Bunchania lanzan*, *Gynandropsis gynandra* and *Moringa oleifera* are applied on snake and scorpion bites.

Plants conserved by tribal people for setting bone fractures

The paste prepared from the stem and leaves of *Alternanthera*

sessilis, *Bauhina purpurea*, *Cassia alata*, *Sida cordata*, and *Vanda tessala* are tied for healing of wound for 10-15 days on broken bones.

Plants conserved by tribal people as medicinal herbs

Primitive and indigenous people have been using several plants for combating diseases for centuries and find wide acceptance in traditional medicinal use. These plants are either used as a powder or decoctions.

Plants conserved by tribal people in abandoned sites of shifting agriculture

The shifting agriculture practice of cultivation of crops is practiced by ethnic societies in the North-East region of India in the states of Asom, Tripura, Mizoram etc. in Central India in the states of Uttar Pradesh, Maharashtra, Odisha and Chhattisgarh, and in South India in the states of Tamil Nadu, Andhra Pradesh, Karnataka and Kerala. In this practice a forest is cleared by felling of trees and plant biomass is burnt and the ashes collected which are sources of essential plant nutrients are spread in the fields. After a year of cultivation, the land is abandoned for several years for regeneration of the fertility of soil. During this period the farmers are moving for cultivation in other land. The tribals do not perform complete felling of forest, but they retain several useful species of horticultutral and agricultural importance.

Plants conserved by tribal people in sacred groves

The ethnic people of India have played a vital role in preserving bio-diversity of several virgin forests and have conserved several flora and fauna in sacred groves of tribals, otherwise these flora and fauna might have disappeared from the natural ecosystem (Table 6). The sacred groves are the natural forests which are located in North-East, Central and Peninsular India. The interference of all kinds of human activities is prohibited in sacred groves.

Table 6. Plants growing in sacred groves in India

Botanical name	Use
<i>Butea monosperma</i>	Medicinal, Dye
<i>Cordia dichotoma</i>	Food, Medicinal
<i>Ravuolfia serpentina</i>	Medicinal
<i>Alstonia scholaris</i>	Medicinal
<i>Helicteres isora</i>	Medicinal
<i>Boswellia serrata</i>	Medicinal
<i>Calotropis gigantea</i>	Medicinal
<i>Carissa congesta</i>	Medicinal
<i>Diospyros montana</i>	Medicinal
<i>Bambusa arundinacea</i>	Miscellaneous

Source: Jain, S.K. Ethnobiology in Human Welfare

Plants in Local Healthcare by Tribal People of Malda District, India

A study explored the indigenous knowledge of the native tribes on the utilization of wild plant species for local healthcare management in Malda district of West Bengal. The study revealed that a total of 53 medicinal plants belonging to 37 families are frequently used to treat 44 types of ailments with 88 herbal preparations. Of the 53 plants, herbs possess the highest growth forms (32%) that were used in making traditional preparation, followed by shrubs (24%), trees (23%), climbers (17%), and parasites (4%). Roots comprised the major plant parts used (25%), followed by leaves (21%), seeds (17%), bark (13%), whole plant (8%) and fruits (6%) to prepare the medicinal formulations. The chief ailments treated in this province were azoospermia, diabetes, menstrual disorder, dysentery and rheumatism.

An Ethnobotanical Study of Palamalai Region of Eastern Ghats, India

The study demonstrated the need for importance of documenting the traditional knowledge of forest dwelling people. A total of 118 plant species belonging to 95 genera and 55 families dominated by the families like Fabaceae, Asteraceae and Lamiaceae was enumerated with detailed information on parts used, method of preparation, mode of administration and ailments treated. The leaves were mostly used plant part and predominantly used herbal preparations were decoction and paste. *Moringa oleifera* Lam. was reported by all the interviewed informants. As a result of the study, *Abutilon indicum* (L.) Sweet., *Andrographis echinoides* (L.f.) Nees., *Bacopa monnieri* (L.) Wettst., *Canarium strictum* Roxb., *Centella asiatica* (L.) Urban., *Senna auriculata* (L.) Roxb. and *Tribulus terrestris* (L.) were recommended for further ethnopharmacological studies.

Ethnomedicinal Study of Plants used in the Nelliampathy Hills of Kerala, India

A total of 85 medicinal plants belonging to 49 families were reported to be used against 19 different ailments in the hills. The maximum reported medicinal plant families were Cucurbitaceae with 6 species followed by Acanthaceae, Malvaceae and Fabaceae (5 species each), Asteraceae, Lamiaceae, Moraceae and Myrtaceae (3 species each), the most dominant life form of the species includes herbs (42) followed by trees (20), climbers (15) and shrubs (8), the most frequent used part were leaves (40%) followed by roots (14%), seed and flowers (12% each), fruits (9%), barks (7%), stems (2%), latex (2%), rhizome and whole plant (1% each), the most common preparation and administration methods

were paste (32%), powder (22%), decoction and juice (20% each) and raw (4%), infusion and inhalation (each 1%).

Traditional Phyto remedies for the Treatment of Menstrual Disorders in District Udhampur, J&K, India

A study was conducted to document traditional phyto remedies for the treatment of menstrual disorders in Udhampur district of J&K, India. A total of 50 plants were used to cure different menstrual disorders. Seeds were found to be of utmost medicinal importance (43.8%) followed by leaves (20.8%) and fruits (16.7%). Oral administration was observed to be the main mode (90.0%) of intake of medicine. The plants with high use-value were *Triticum aestivum* (UV=1.76), *Taraxacum officinale* (UV=1.16), *Citrus limon* (UV=0.95), *Allium cepa* (UV=0.79), *Cicer arietinum* (UV=0.77), *Trigonella foenum graecum* (UV=0.66), *Rubia cordifolia* (UV=0.56), *Ocimum tenuiflorum* (UV=0.56) and *Oryza sativa* (UV=0.52). The various menstrual disorders were classified into 7 categories.

Medicinal Plants used by Tribal Population of Coochbehar District, West Bengal

A total of 46 plant species belonging to 42 genera and 27 families were reported to be used for treating 33 types of physical ailments. In terms of the number of medicinal plant species, Fabaceae (5 species) and Euphorbiaceae (4 species) are dominant families. Among different plant parts used for the preparation of medicine, leaves were most frequently used.

An Ethnobotanical Study of Thoppampatti, Dindigul District, Tamil Nadu

A total of 139 species of plants, mostly trees and herbs, belonging to 54 families were identified in this study to treat 142 diseases and ailments. These ailments were divided into 18 major categories. Leaves were the most frequently used parts, while decoction and juice are the most common methods of preparation to treat various diseases. Based on IUCN Red data the identified medicinal plants include 11 least concerned species, 3 vulnerable species and one endangered species. The most important species according to their use value were *Cynodon dactylon* (0.79), *Azadirachta indica* (0.73), *Ocimum tenuiflorum* (0.71), *Moringa oleifera* (0.68), *Coriandrum sativum* (0.62), *Abelmoschus esculentus* (0.61), *Acalypha indica* (0.59) and *Hibiscus rosa-sinensis* (0.59).

Ethnobotanical Survey of Tirunelveli Hills of Western Ghats

Kani tribal people in Tirunelveli hills still depend on medicinal plants and most of them have a general knowledge of medicinal plants

which are used for first aid remedies, to treat cough, cold, fever, headache, poisonous bites and some simple ailments. A total of 90 species of plants distributed in 83 genera belonging to 52 families were identified as commonly used ethnomedicinal plants by the Kani traditional healers in Tirunelveli hills for the treatment of 65 types of ailments. The most important species according to their use value were *Gymneme sylvestre* (2.00), *Melia azedarach*, *Murraya koenigii*, *Syzygium cumini* and *Terminalia chebula* (1.83).

Traditional Plants in Indigenous Folklore of Nizamabad District, Andhra Pradesh

Seventy seven plant species belonging to 39 Angiospermic families are used. Of these, maximum species belong to Euphorbiaceae with 7 species and Asclepiadaceae, and Fabaceae with 6 species each. Majority of preparations are from the leaves and some are of underground parts (like root, rhizome, tuber, etc.).

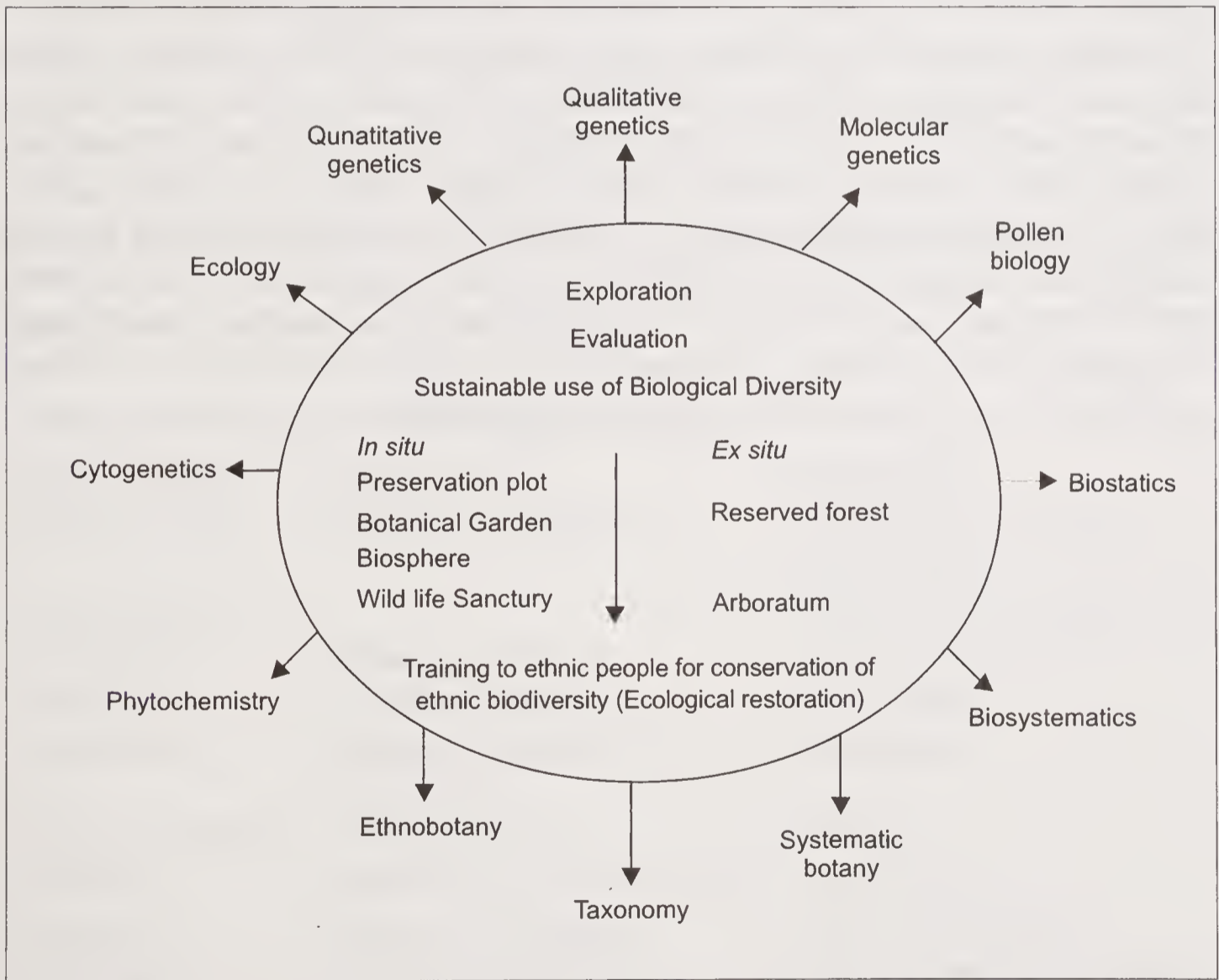


Fig 7. Ecological restoration and conservation of biodiversity

Source: Food and Agriculture Organization of the United Nations, The Role of Ethnic and Indigenous People of India and their Culture in the Conservation of Biodiversity (Rai and Nath). Reproduced with permission.

Medical Ethnobotany of the Siddis of Uttara Kannada District, Karnataka

A total of 98 medicinal preparations, involving 69 species of plants, used by the Siddis of Uttara Kannada in Karnataka are described in this paper based on an ethnomedical field study. The finding includes 40 hitherto unknown medicinal uses of known medicinal plants. Among these, the use of the stem sap of *Calamus thwaitesii* as an antifertility drug, and the use of the flowers of *Ichnocarpus frutescens* and the rhizome of *Hedychium coronarium* in the treatment of diabetes are noteworthy.

Integrated Approach

India in the present scenario is rich in biodiversity. The indigenous people have helped in conservation of biodiversity. However, efforts for conservation have to be made in both vertical as well as horizontal directions due to rapid industrial revolution. Conservation of diversity, sustainable management, propagation of such valued flora and their *in-situ* as well as *ex-situ* conservation are the need of this century. Therefore, various disciplines like Genetics, Pollen biology, Tree Breeding, Ecology, Botany, Physiology, Eco-restoration, Taxonomy, Ethnobotany, Taxonomy, Phytochemistry, Biometrics and Biostatics should work at one platform and linkages have to be established (Fig 7). Sacred forests as well as localities dominated by ethnic people need to be surveyed for identification of plants associated with various ethnobotanical uses followed by phytochemical studies. Awareness campaigns and training programmes are to be organized in tribal localities for eco-restoration and conserving flora.



4

Medicinal Plants and their Folk Uses

Folk Medicine

Folk medicine consists of traditional healing concepts and methods used in past cultures by people deemed to have the healing power. Often based on religious beliefs, these practices are used to cure diseases and promote emotional and physical well being.

Doctrine of Signatures

The doctrine of signatures was an important aspect of folk medicine from the middle Ages until the early modern period. The doctrine of signatures states that medicinal herbs that have a resemblance to various parts of the human body, can be used by herbalists to treat diseases of those parts of the body. Folk healers in Christian and Muslim countries are of the view that God, or Allah, has deliberately made plants resemble the parts of the human-body they could cure. Signatures of some plants used in herbalism are given in Table 7.

Table 7. Signatures of some plant used in herbalism

Common name	Botanical name	Therapeutics
Adders tongue	<i>Erythronium americanum</i>	Wounds and inflammation from snakebite
Black-eye root	-	Discoloration of bruises
Bloodroot	<i>Monarda punctata</i> L.	Blood-diseases
Eyebright	<i>Euphrasia officinalis</i> L.	Eye-infections
Gravelwort	<i>Eutrochium purpureum</i> (L.) E.E. Lamont	Kidney-stones
Hedge woundwort	<i>Stachys sylvatica</i> L.	Antiseptic
Liverwort	<i>Hepatica americana</i> (DC.) Ker	Liver-diseases
Lungwort	<i>Pulmonaria officinalis</i> L.	Pulmonary-infections
Mandrake	<i>Mandragora officinarum</i> L.	For sexual passion in females
Pilewort	<i>Erechthites hieracifolia</i> L.	Haemorrhoids (piles)
Snakeroot	<i>Ageratina altissima</i> (L.) King & H.E.Robins.	Antidote for snake venom
Spleenwort	<i>Asplenium trichomanes</i>	Spleen-infections
Toothwort	<i>Lathraea squamaria</i> L.	Tooth-ailments
Wormwood	<i>Artemisia absinthium</i> L.	Worm-infestation

Shamanism

Shamanism is a range of traditional beliefs and practices that involve the ability to diagnose, cure, and sometimes cause human suffering by traversing the axis mundi and forming a special relationship with, or gaining control over, spirits. Shamans have been credited with the ability to control the weather, divination, the interpretation of dreams, astral projection, and travelling to upper and lower worlds. Shamanistic traditions have existed throughout the world since prehistoric times.

Hallucinogenic Medicinal Plants in Folk Medicine

Amantia muscaria (L.) Lam (Amanitaceae)

It is commonly known as flying agaric. *A. muscaria* is noted for its hallucinogenic properties, with its main psychoactive constituent being the compound muscimol (Fig 8) and ibotenic acid (Fig 9). Muscarine (Fig 10) is in trace amounts. The mushroom was used as an intoxicant and entheogen by the peoples of Siberia, and has a religious significance in these cultures. There has been much speculation on possible traditional use of this mushroom as an intoxicant in other places such as the Middle East, Eurasia, North America, and Scandinavia.

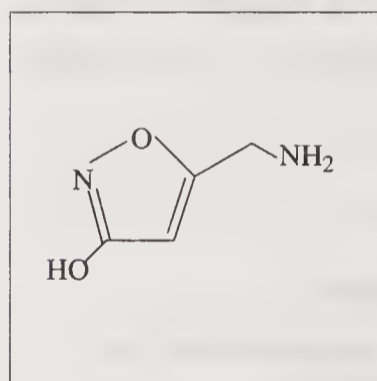


Fig 8. Structure of muscimol

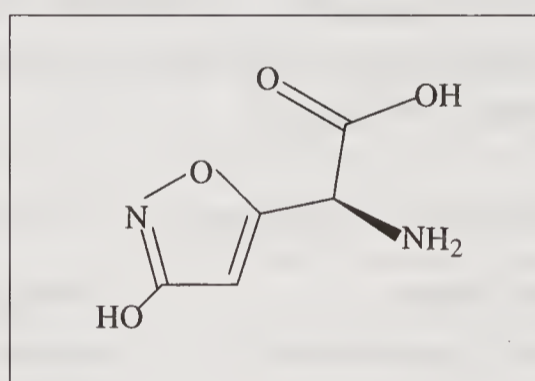


Fig 9. Structure of ibotenic acid

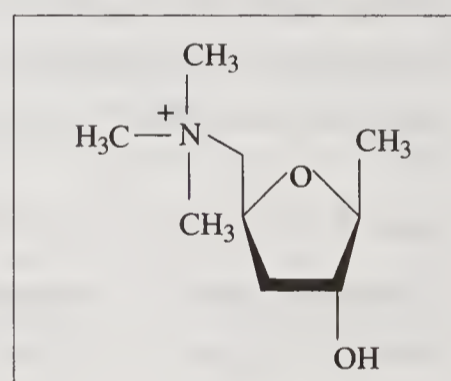


Fig 10. Structure of muscarine

Banisteriopsis caapi (Spruce ex Griseb.) cv Morton (Malpighiaceae)

B. caapi is popularly known as ayahuasca. The plant is used to prepare a decoction, popularly known as ayahuasca. The indigenous people of the Amazon use ayahuasca for entheogenic uses as a medicine. Basically, it has hypnotic property. It

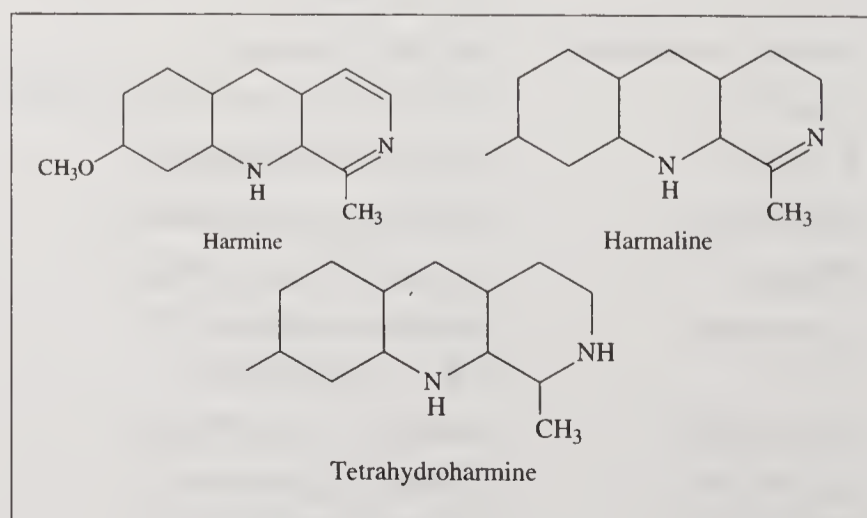


Fig 11. Alkaloids of *B. caapi*

contains β -carbolin alkaloids, harmine, harmaline and tetrahydroharmine (Fig 11), which are potential monoamine oxidase inhibitors, which make *N,N*-Dimethyltryptamine (Fig 12) to be orally active.

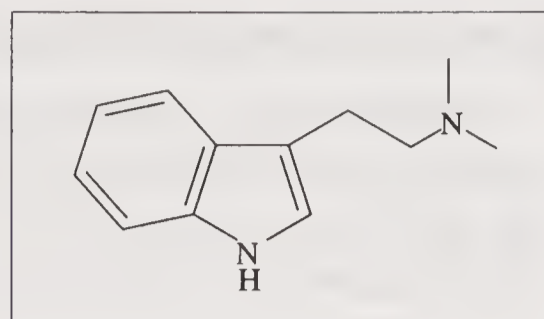


Fig 12: Structure of *N,N*-Dimethyltryptamine

***Brunfelsia chiricaspi* L. (Solanaceae)**

B. chiricaspi is a Neotropical shrub or small tree. It is used as an admixture in ayahuasca brews. It is poisonous to domestic animals due to presence of brunfelsamidine (Fig 13).

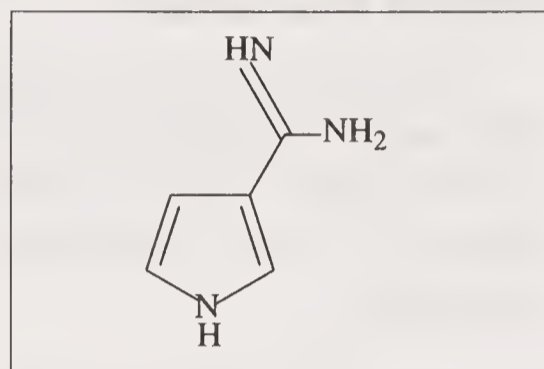


Fig 13: Structure of *N,N*-Dimethyltryptamine

***Brugmansia arborea* Pers (Solanaceae)**

It is native to South America and commonly known as angel's trumpets. It has been used as an admixture plant in ayahuasca brews. It contains alkaloids (atropine, scopolamine and hyoscyamine).

***Calea ternifolia* Kunth (Asteraceae)**

C. ternifolia is native to Central America and Mexico. The common name is bitter grass. The Chontal people of Oaxaca reportedly use the plant, known locally as thle-pela-kano, during divination. The sesquiterpenes (caleicines and caleochromenes) are considered to be the active principles.

***Calea zacatechichi* (Asteraceae)**

Dream Herb was traditionally used by the Chontal Natives of Oaxaca, Mexico. It would be prepared as a tea and drunk while smoking a cigarette made up of the *C. zacatechichi* foliage just before going to bed.

***Catha edulis* (Vahl) Forssk. ex Endl. (Celastraceae)**

Khat is a drought-tolerant evergreen shrub. The leaves contain alkaloids; cathinone and cathine (Fig 14). These leaves are traditionally chewed by people of E. Africa and the Middle East as a stimulant. It has a long history of human use.

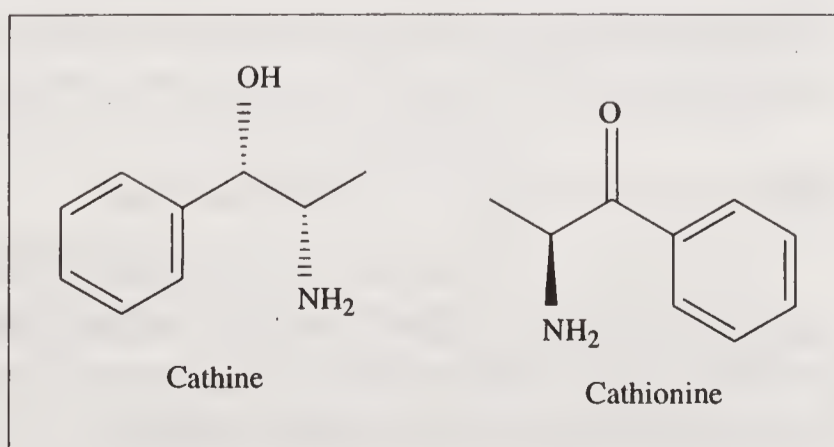


Fig 14. Alkaloids of *Catha edulis*

***Coriaria thymifolia* Humb. and Bonpl. Ex Willd. (Coriariaceae)**

It is known as Shanshi and is widespread in the northern Andes. It is used as a hallucinogen by peasants in Ecuador. The fruits are eaten for their intoxicating effects, which include the sensation of flight. The weird effects are due possibly to an unidentified glycoside.

***Desmanthus illinoensis* (Michx.) MacMill. ex B. L. Rob. and Fernald (Fabaceae)**

It is native to North America and popular name is prickly weed. The root bark is mixed with a native source of beta-carbolines to produce a hallucinogenic drink called prairiehuasca, which is an analog of the shamanic brew ayahuasca. Root bark contains several β -carboline alkaloids.

***Diplopterys cabrerana* (Cuatrec.) B. Gates (Malpighiaceae)**

D. cabrerana is found in Africa and Indonesia. It is a tropical vine which produces DMT in its leaves. It is used as an admixture plant in South American ayahuasca brews.

***Duboisia hopwoodii* (F. Muell.) F. Muell. (Solanaceae)**

It is commonly known as "Pituri" and native to interior range of Australia. Indigenous Australians mix the dried leaves of a small population of *D. hopwoodii* growing around the Mulligan River with wood ash to make a variety of pituri, the traditional aboriginal chewing mixture. It contains a good amount of nicotine.

***Galbulimima belgraveana* (F. Muell.) Sprague (Himantandraceae)**

It is commonly known as white magnolia. *G. belgraveana* is native to north-eastern Australia, Malaysia, and Papua New Guinea. Papuans (who tend to use this drug the most) boil the bark and the leaves together with another plant, called *Homalomena* sp. (Araceae) leaves (ereriba) in order to make tea. This tea leads to a deep sleep, in which it is said that vivid dreams and visions occur. Several alkaloids related to himbacine have been isolated from white magnolia, and although they are biologically active, the psychoactive principle is still to be traced.

***Hyoscyamus niger* L. (Solanaceae)**

H. niger was used as a ritual plant by the pre-Indo-European people of central Europe. The Gauls of ancient Western Europe poisoned their javelins with a decoction of henbane. The Assyrians add it to beer as a way of making it more intoxicating.

***Justicia pectoralis* L. var. *stenophylla* (Acanthaceae)**

It is a small herb cultivated by the Waiká Indians of the Brazilian-Venezuelan frontier region. The aromatic leaves are occasionally dried, powdered, and mixed with the hallucinogenic snuff made from resin of the *Virola* tree. Across its range it is used in folk medicine as a relaxant and general tonic. Additionally, it is often used in Ayahuasca, a tea containing the *Banisteriopsis caapi* vine.

***Lagochilus inebrians* Bunge (Labiatae)**

It is commonly known as Turkestan mint or intoxicating mint and found in the dry steppes of Turkestan. For centuries it has been the source of an intoxicant among the Tajik, Tartar, Turkoman, and Uzbek tribesmen. *L. inebrians* is used in folk medicine and has been included in the 8th edition of the Russian pharmacopoeia. In folk medicine, it is used in the treatment of skin-diseases, to stop bleeding, and to induce sedation in nervous ailments. The plant contains a diterpene compound known as lagochilin (Fig 15).

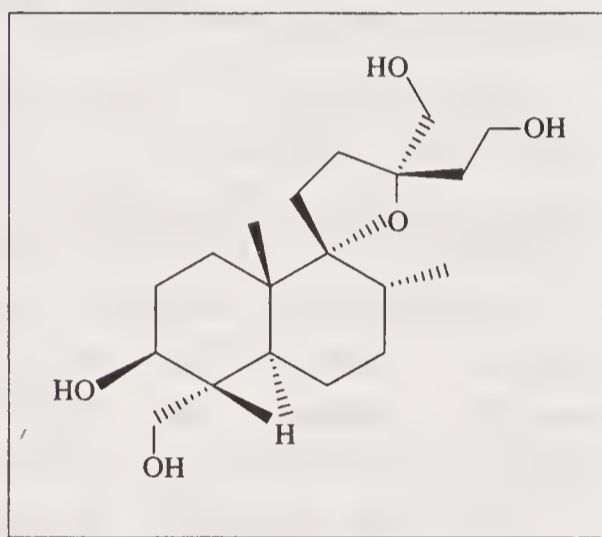


Fig 15. Structure of lagochilin

***Leonotis leonurus* L. (Lamiaceae)**

Wild dagga is purported to have hallucinogenic effects when either its buds or leaves are dried and smoked. In Africa, the Hottentot tribe and the Bushmen are known to smoke the buds and leaves of the wild dagga plant as inebriants, either alone or mixed with tobacco. *L. leonurus* is used by the Kaffirs for recreational purposes, and the Nama tribe people chew quids of powdered leaves to produce psychoactive effects.

***Lobelia tupa* L. (Lobeliaceae)**

A tall, variable plant of the high Andes, is also called tabaco del diablo (devil's tobacco). The Mapuche Indians of Southern Chile consider it a sacred plant. The Mapuche Indians smoke the dried leaves of this beautiful red-flowered plant for their narcotic effects. Whether they are truly hallucinogenic has not yet been established.

***Mandragora officinarum* L. (Solanaceae)**

It is commonly known as Mandrake. The root is hallucinogenic and narcotic. The shape of their roots often resembles human figures; they have been associated with a variety of superstitious practices throughout history. They have long been used in magic rituals, today also in contemporary pagan traditions such as Wicca and Odinism.

Mesembryanthemum expansum L. and *M. tortuosum* (Aizoaceae)

Kanna is the common name for the two South African plants. As per evidence, it is estimated that either of the plants has been used by the Hottentots of South Africa as vision inducing narcotics. As per reports, the Hottentots chewed the roots of the plants. Chemical studies have reported the presence of alkaloids (4'-O-demethylmesembrenol, mesembrine (Fig 16) and mesembrenone, and tortuosamine). Mesembrine is antidepressant.

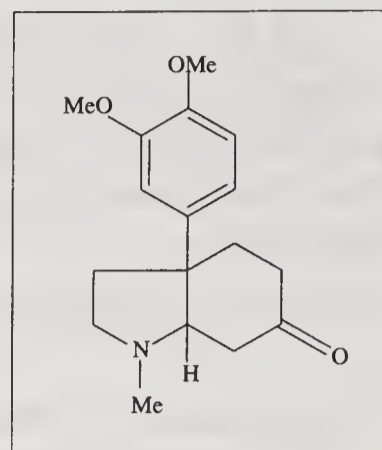


Fig 16. Structure of mesembrine

Mimosa tenuiflora (Willd.) Poir. (Fabaceae)

M. tenuiflora is a perennial tree or shrub and native to the northeastern region of Brazil. The parts of the tree are traditionally used in northeastern Brazil in a psychoactive decoction also called Jurema or Yurema. The root bark has been recently shown to have a DMT (Dimethyltryptamine) content of about 1-1.7%. The isolation of the chemical compound yuremamine (Fig 17) represents a new class of phyto-indoles, which may explain an apparent oral activity of DMT in Jurema.

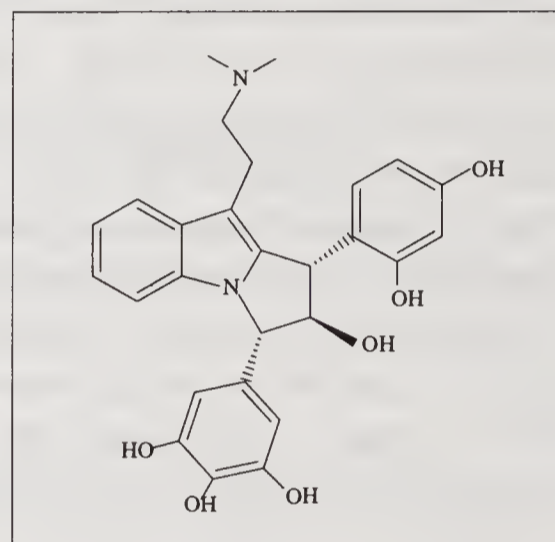


Fig 17. Structure of yuremamine

Mitragyna speciosa (Korth.) Havil. (Rubiaceae)

Kratom is native to South East Asia. It was used in Southeast Asia and by Thai natives to substitute for opium when opium was not available. It contains alkaloids like mitragynine, mitraphylline and 7-hydroxymitragynine.

Pancratium trianthum Herb. (Amaryllidaceae)

P. trianthum is commonly known as Sea Daffodil. Bushmen in Dobe, Botswana consider the plant to be psychoactive. The bulb is rubbed over incisions in the head to induce visual hallucinations. Haemanthamine (Fig 18) is the main alkaloid in the leaves and bulbs, whereas galanthane is the main alkaloid in roots.

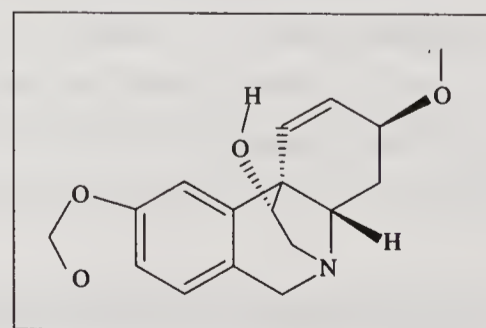


Fig 18. Structure of haemanthamine

Psychotria viridis Ruiz and Pav. (Rubiaceae)

In the Quechua languages, it is called chacruna, which means to fix.

It contains *N, N*-Dimethyltryptamine. The Machiguenga people of Peru use juice from the leaves as eye drops to treat migraine.

***Salvia divinorum* Epling and Játiva (Lamiaceae)**

S. divinorum is commonly known as Shepherdess's Herb. It is found in the Sierra Mazatec region of Mexico. It has a history of buccal use as a divinatory psychedelic, and has been widely available since the mid 1990s primarily as a smoked herb. Mazatec shamans have a long and continuous tradition of religious use of *S. divinorum*, using it to facilitate visionary states of consciousness during spiritual healing sessions. Leaves contain the active principle, salvinorin A (Fig 19). It is a powerful mind-alerting compound.

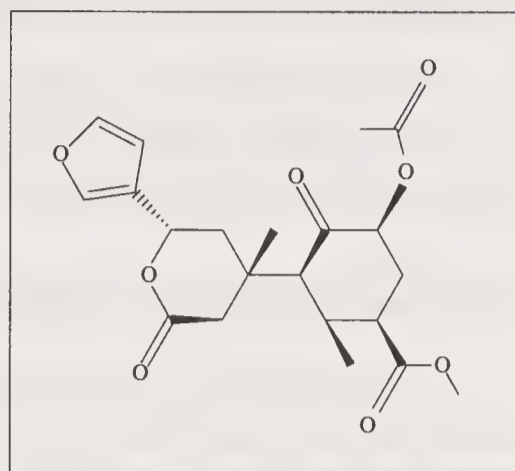


Fig 19. Structure of salvinorin A

***Silene undulata* Aiton (Caryophyllaceae)**

The root is traditionally used to induce vivid, lucid dreams during the initiation process of shamans.

***Solenostemon scutellarioides* (L.) Codd (Labiatae)**

Common name is flame nettle. It has been used by the Mazatec Indians of Oaxaca as a replacement for *Salvia divinorum*, though little is known about its effects or active chemicals.

***Tabernaemontana sananho* Ruiz & Pav. (Apocynaceae)**

T. sananho grows in the Amazon Basin of northern South America. The Amazonian Indians from the Ticuna tribe mix the latex from a closely related species, *Tabernaemontana sananho*, with water in order to treat eye wound.

***Tabernaemontana undulata* Vahl (Apocynaceae)**

It is popularly known as Becchete and found in the Amazon rainforest. The tribes apply directly to the eyes for visual effects. Like *Tabernanthe iboga* and *Voacanga africana*, ibogaine is the main compound.

***Tabernanthe iboga* (L.) Nutt. (Apocynaceae)**

T. iboga is native to Gabon and the Congo. The yellowish root of the iboga plant is employed in the initiation rites of a number of secret societies, the most famous being the Bwiti cult. The drug, discovered by Europeans toward the middle of the last century, has a reputation as a

powerful stimulant and aphrodisiac. Ibogaine (Fig 20) is the principal alkaloid among many discovered from this plant.

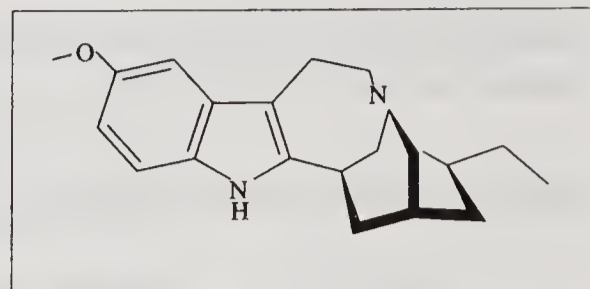


Fig 20. Structure of Ibogaine

Tetrapteris methistica (Malpighiaceae)

This is source of caapi. Maku Indians of the northwestern most part of the Brazilian Amazon prepare a cold-water drink from the bark.

Voacanga africana Stapf (Apocynaceae)

V. africana is a small tropical tree growing in Africa. The bark and seeds of the tree are used in Ghana as a poison, stimulant, aphrodisiac, and ceremonial psychedelic. This plant is used by the Diola of Africa against infectious diseases. West African shamans are said to ingest the root-bark as a cerebral stimulant and the seeds for visionary purposes. Small amounts of ibogaine are found in *V. africana* root-bark, but not in sufficient quantity to have many medicinal effects.

Withania somnifera Dunal (Solanaceae)

W. somnifera was employed in sexual magic and *tantric* rituals as an aid in sustaining the vital duration of erections. Folk healers known as vaidyas (Ayurvedic physicians) still prepare a love potion from the root. Its effects are said to attract the opposite sex and make one ready for love. It is mentioned frequently in the Atharva Veda, and is considered second in importance to soma.

The ancient Arabs used the root as a narcotic, a health tonic, and an aphrodisiac. In Pakistan, the leaves of the closely related *Withania coagulans* were presumably smoked as a means to become intoxicated. The root has been used historically as a substitute for mandrake (*Mandragora officarum*).

Medicinal Plants Used in Folk Medicine and Utilization in the Pharmaceutical Industry

Ancistrocladus korupensis D.W. Thomas and Gereau (Ancistrocladaceae)

It is a twinner obtained from the aborigines of Cameron forest in South Africa. In 1991, National Cancer Institute (NCI) reported HIV inhibitory activity of michellamine-B, an alkaloid isolated from the leaf-extract of *A. korupensis*.

Artemisia annua L. (Asteraceae)

A. annua is commonly known as sweet wormwood. For more than

2000 years, decoction prepared from the plant has been used in the treatment of periodical fever in Traditional Chinese Medicine (TCM). The fresh juice soaked by the entire plant was found to be most effective in relieving chills and fever when used in large dosage. Artemisia's historical usage to 'clear damp heat' associated with malaria has then been confirmed with modern pharmacology. Artemisinin (Fig 21) isolated in 1972 is found in the leaves and stems of *A. annua*. Artemisinin has been actively and successfully promoted by the pharmaceutical industry as an antimalarial drug.

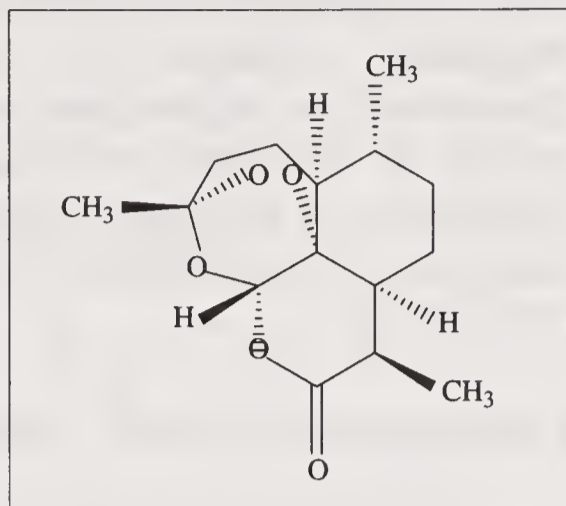


Fig 21: Structure of artemisinin

Arundo donax L. (Poaceae)

Central Asian camels refused to eat a certain type of reed, *Arundo donax*. Characterization of gramine as the antifeedant principle led to the synthesis of isogramine (taste-test: numbness). Isogramine was found to have weak anesthetic property and further, lidocaine was synthesized (Fig 22).

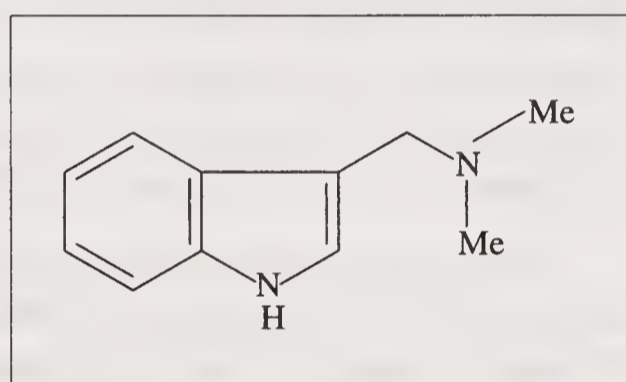


Fig 22. Structure of gramine

Bleekeria vitensis A. C. Sm. (Apocynaceae)

Ellipticine (Fig 23) isolated from this plant is marketed in France for the treatment of breast cancer.

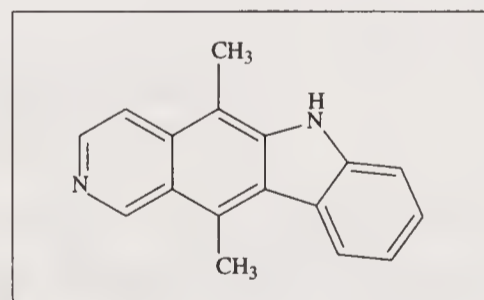


Fig 23. Structure of ellipticine

Calophyllum teysmannii Miq. var. *inophylloide* (King)

It is a source of potential anti-AIDS drug, calandolide B (Fig 24). Discovery of the molecule from the tree in Sarawak, Malaysia, resulted in the promotion of conservation and replanting of seedlings in clear-cut regions. It further led to the establishment of the Sarawak Biodiversity Centre for in-country research on drug discovery from local biodiversity.

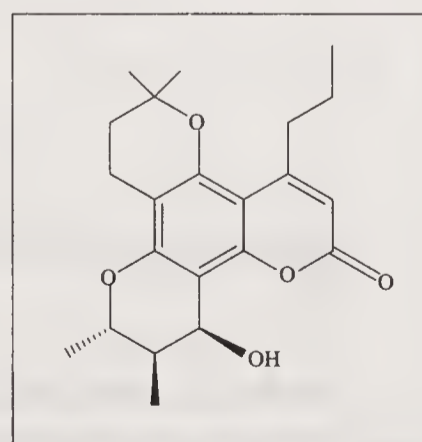


Fig 24. Structure of calandolide B

Camptotheca acuminata Decne (Nyssaceae)

C. acuminata (Camptotheca, Happy tree), a tree native to China is

used as a cancer treatment in Traditional Chinese Medicine. Camptothecin (Fig 25) was discovered from extracts of plants originally collected by the U. S. Department of Agriculture as a possible source of steroidal precursors for the production of cortisone. Topotecan and irinotecan are effective camptothecin derivatives.

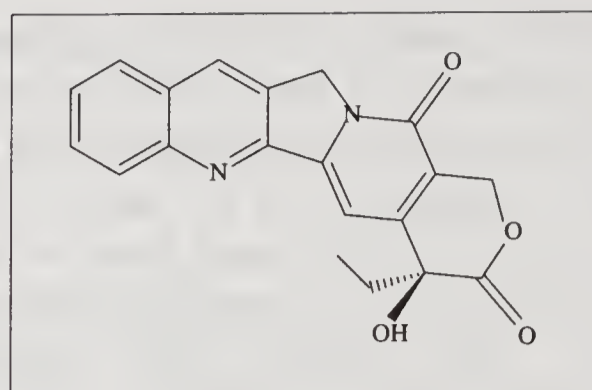


Fig 25. Structure of camptothecin

Catharanthus roseus L. (Apocynaceae)

C. roseus is known as the common or Madagascar periwinkle and is native to the island of Madagascar. In Europe, it is used as a folk remedy for diabetes for centuries. In India, juice from the leaves is used to treat wasp stings. In Hawaii, it is boiled to make a poultice to stop bleeding. In Traditional Chinese Medicine (TCM), it is used as an astringent, diuretic and anti-tussive. In Central and South America, it is used in homemade cold remedy to ease lung congestion and inflammation and sore throats. Throughout the Caribbean, a flower extract is used in the treatment of eye irritation and infections.

The two groups independently working on periwinkle in the 1950s, learned of a tea Jamaicans were drinking to treat diabetes. University of Western Ontario - Beer and Noble-interested in the plant as a possible "oral insulin" - they isolated alkaloid, vinblastine (Fig 26).

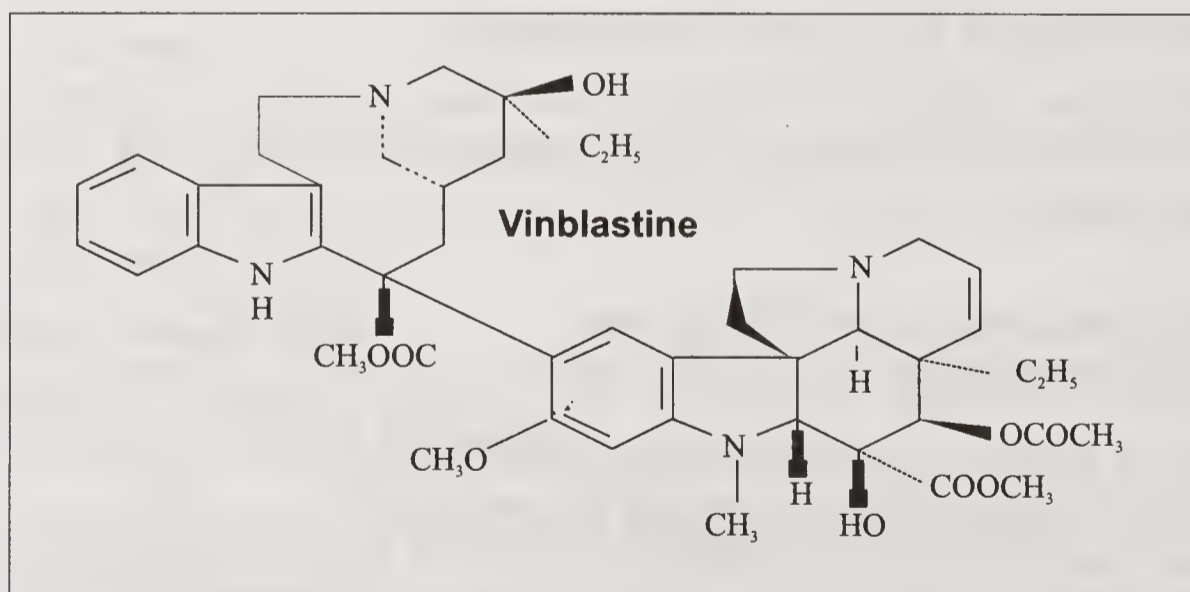


Fig 26. Structure of vinblastine

Svoboda injected a crude extract of the whole periwinkle plant into mice that were infected with P-1534 leukemia. 60-80% of the mice experienced prolonged life Lilly produced vinblastine under the trade name Velban. Another alkaloid was synthesized and named vincristine (Fig 27).

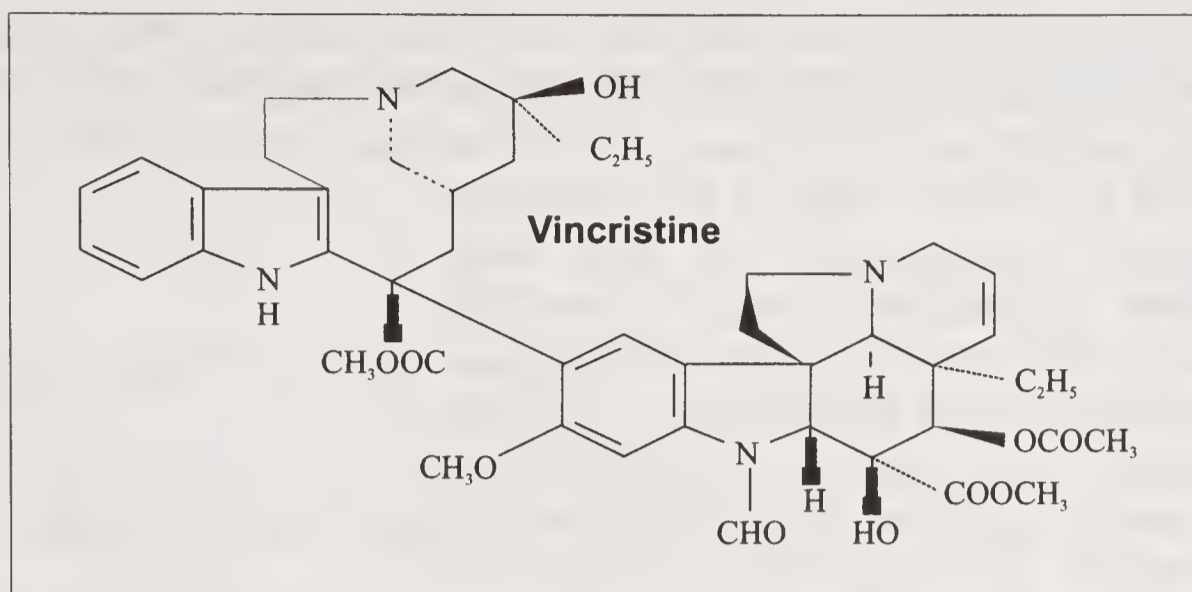


Fig 27. Structure of vincristine

Vincristine has been especially effective for treating acute childhood leukemia, often with 99% remission rates. Vinblastine has been especially effective for treating Hodgkin's disease - which had been considered fatal up to that point.

***Cephalotaxus harringtonia* var. *drupacea* (Sieb and Zucc.) (Cephalotaxaceae)**

A racemic mixture of harringtonine and homoharringtonine (Fig 28) has been used successfully in China for the treatment of acute myelogenous leukemia and chronic myelogenous leukemia.

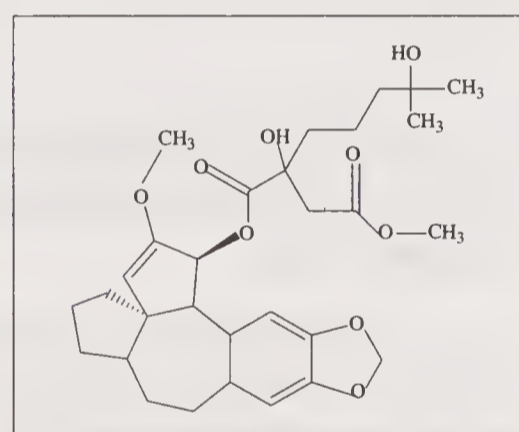


Fig 28. Structure of homoharringtonine

***Chondrodendron tomentosum* L. (Menispermaceae)**

It is popularly known as curare. The Sionas of Colombia, the Lamistas of Peru and the Ketchwas of Ecuador use curare vine as an arrow poison. These poisons are not actually true toxins - rather they are potent muscle relaxants. The main alkaloid responsible for muscle relaxant action of curare is d-tubocurarine (Fig 29), isolated in 1987.

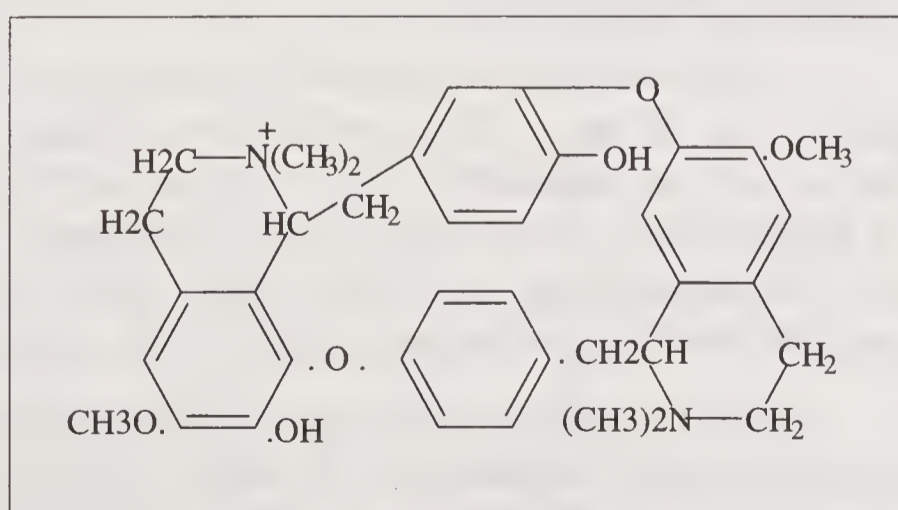


Fig 29. Structure of d-tubocurarine

***Cinchona* spp (Rubiaceae)**

Malaria is one of the top killer diseases in the world. The evidence clearly suggests that malaria was a concern back to 500 BC. There were

lots of folk remedies, but definite cure was eluding the humanity. Quinine was discovered from the Cinchona tree originating from South America and for several years, it remained the drug of choice for the treatment of malaria. Why is the discovery of quinine significant? At this time European colonialism was expanding explosively into the Americas, Africa, India, Indonesia, and other areas of Asia. All these expansions were partially fueled by the "discovery" of quinine (Fig 30). Without this it is unlikely that expansion would have occurred nearly as quickly, since many colonialists were killed by malaria.

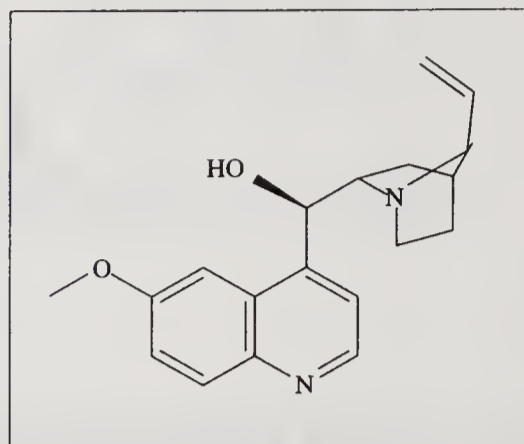


Fig 30. Structure of quinine

Combretum cafferum (Eckl. & Zeyh.) Kuntze (Combretaceae)

It is known as African bush willow tree and is a source of potential anticancer drugs known as combretastatins (Fig 31).

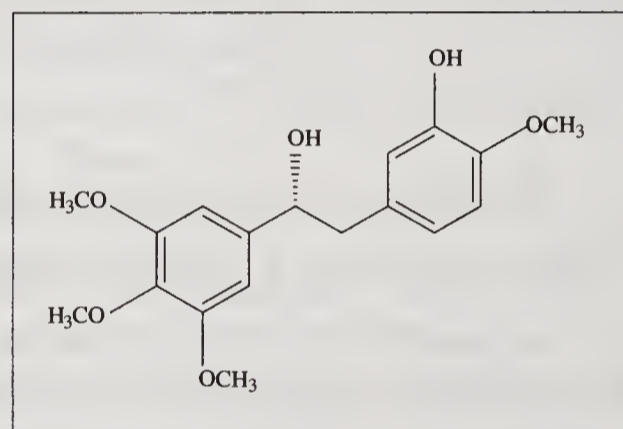


Fig 31. Structure of combretastatin

Dysoxylum binectariferum Hook.f. ex Bedd. (Meliaceae)-source of flavopiridol

D. binectariferum has been used by physicians of Ayurveda for diseases of liver and spleen enlargement (hepatosplenomegaly) and inflammation. It contains alkaloid known as rohi kutine, which is source of anticancer drug, flavopiridol (Fig 32).

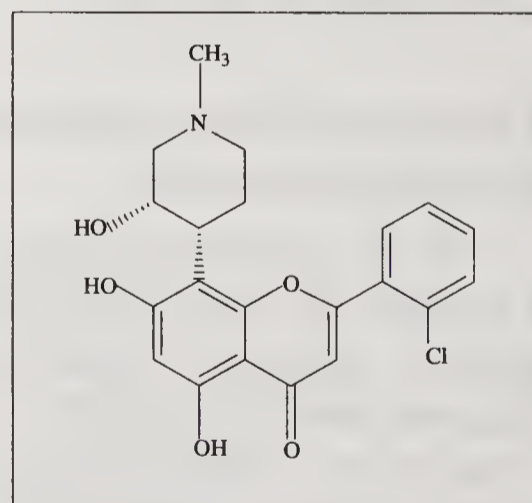


Fig 32. Structure of flavopiridol

Galega officinalis L.

G. officinalis is commonly known as goat's rue. It has wide application in folk medicine as an antidiabetic agent. The extracts of *G. officinalis* were used in the treatment of diabetes mellitus in France since 1930. *G. officinalis* has been part of modern herbal pharmacopoeias for the treatment of diabetes.

Initial scientific studies reported alkaloidal guanidine derivatives as possible active ingredients. However, these guanidine derivatives were toxic. Galegine (Fig 33) one of the guanidine derivatives, was found to be less toxic. The biguanide class of antidiabetic drugs phenformin, buformin and metformin, originates from goat's rue.

Aron Laboratories was taken over by Lipha Pharmaceuticals (now

known as Merck), and in 1995 the metformin was brought to the USA where it enjoyed blockbuster status under franchise to Bristol Myers Squibb.

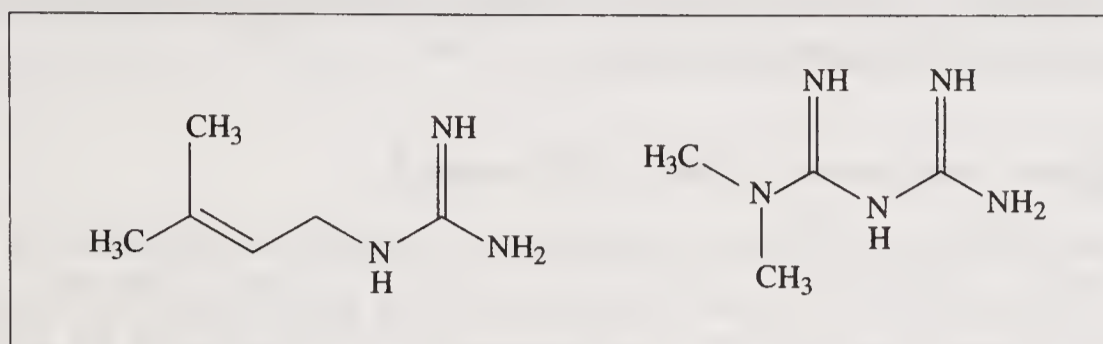


Fig 33. Structures of galegine and metformin

Homalanthus nutans (G. Forst.) Guill. (Euphorbiaceae)

A bark-decoction of the plant is used in the treatment of hepatitis by Samoan healers. The credit in the development of anticancer drug, prostratin from *H. nutans* goes to the traditional healers of Samoan.

Hydnocarpus wightiana Blume (Achariaceae)

H. wightiana is a source of chaulmoogra oil, the only substance found to be effective in the treatment of leprosy as far as history is concerned. More recently, chaulmoogra oil has been replaced by synthetic derivative, Dapsone. It was only made possible by studying the active principle of the chaulmoogra plant (hydnocarpic acid (Fig 34) is the active principle of the plant). Currently there are many strains of *Mycobacterium leprae* showing resistance to Dapsone.

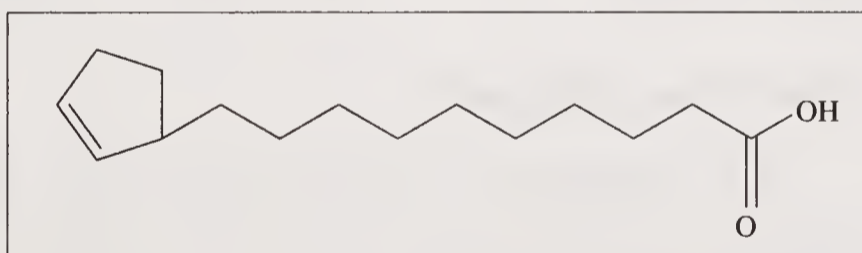


Fig 34. Structure of hydnocarpic acid

Podophyllum species

The *Podophyllum* species (Podophyllaceae), *P. peltatum* L. (May apple), and *P. emodii* Wallich from the Indian subcontinent, have been used in the treatment of skin cancers and warts. *P. peltatum* was used by the Penobscot Native Americans of Maine for the treatment of "cancer", and interest was promoted by the observation in the 1940s that venereal warts could be cured by topical application of an alcohol extract of the dried roots (called podophyllin). The major active constituent, podophyllotoxin (Fig 35), was first isolated in 1880, but its correct structure was only reported in the 1950s.

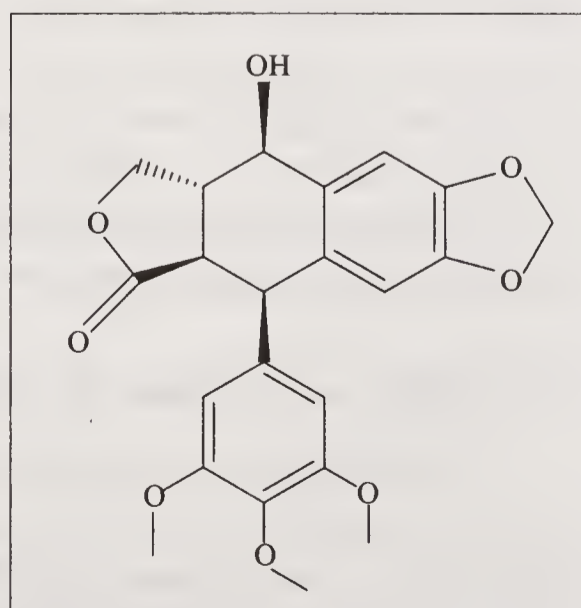


Fig 35. Structure of podophyllum

Extensive research at Sandoz Laboratories in Switzerland in the 1960s and 1970s led to the development of etoposide and teniposide as clinically effective agents which are used in the treatment of lymphomas and bronchial and testicular cancer.

Physostigma venenosum Balf. (Fabaceae)

P. venenosum is commonly known as Calabar bean and is a violent poison. The seeds were used traditionally in southeastern Nigeria, for ritual deaths associated with the funeral of a chief and as an ordeal poison, claimed to determine the guilt or innocence of persons accused of a crime. Rapid death was an indication that the suspect was guilty and innocence was shown by the survival. The plant came into the limelight due to discovery of its power of contracting the pupil of the eye. It was introduced into medical practice as a valuable local agent in certain conditions of the eyes from which it has been successfully employed internally in certain nervous disorders. The alcoholic extract of the bean was the preparation formerly used in ophthalmic practice as a local application to the eye, while at present the alkaloid physostigmine (serine) (Fig 36) has largely supplanted the use of the extract.

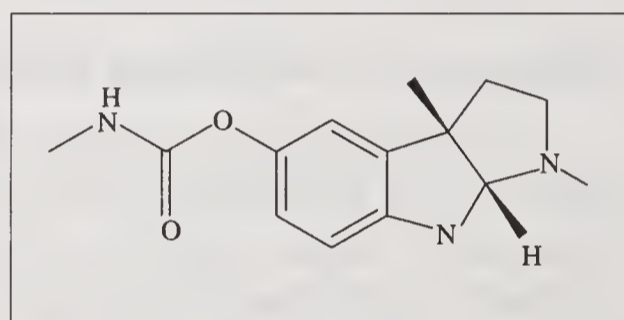


Fig 36. Structure of physostigmine

Pilocarpus jaborandi

It is documented that jaborandi was used by the Guarani Indians of Brazil in the treatment of mouth ulcers. In tribal medicine of several countries, the plant has been used to induce salivation. In Brazilian folk medicine, *P. jaborandi* is used in the treatment of asthma, bronchitis, pneumonia, diphtheria, nasal-catarrh, laryngitis, anuria, hepatitis, diabetes, kidney diseases, edema and fever. It was in 1857 that pilocarpine (Fig 37), the active alkaloid was isolated from the plant. Later on in 1876, pilocarpine was introduced in ophthalmology for the treatment of glaucoma.

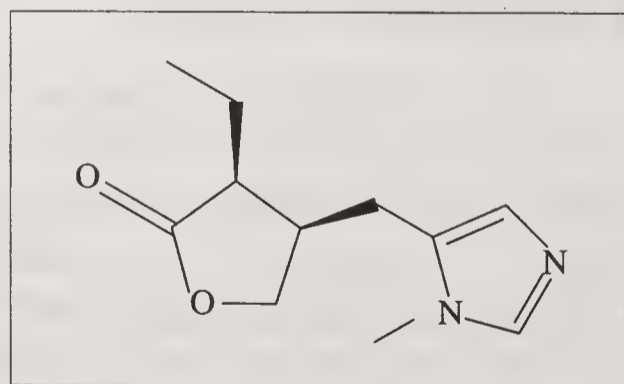


Fig 37. Structure of pilocarpine

Rauwolfia serpentina (L.) Benth. ex Kurz (Apocynaceae)

R. serpentina is popularly known as sarpagandha in Ayurvedic system of medicine. It is used in the treatment of hypertension, insanity and epilepsy. Reserpine (Fig 38) was isolated in 1952 from the dried root of *R. serpentina*, which accounted for approximately 50% of the activity

(psychotropic as well as antihypertensive) of the *Rauwolfia* root. Again, it proved to be the gold standard in the treatment of hypertension. For years, therefore, *Rauwolfia* derivatives played an important part in antihypertensive therapy, before being supplanted by other agents.

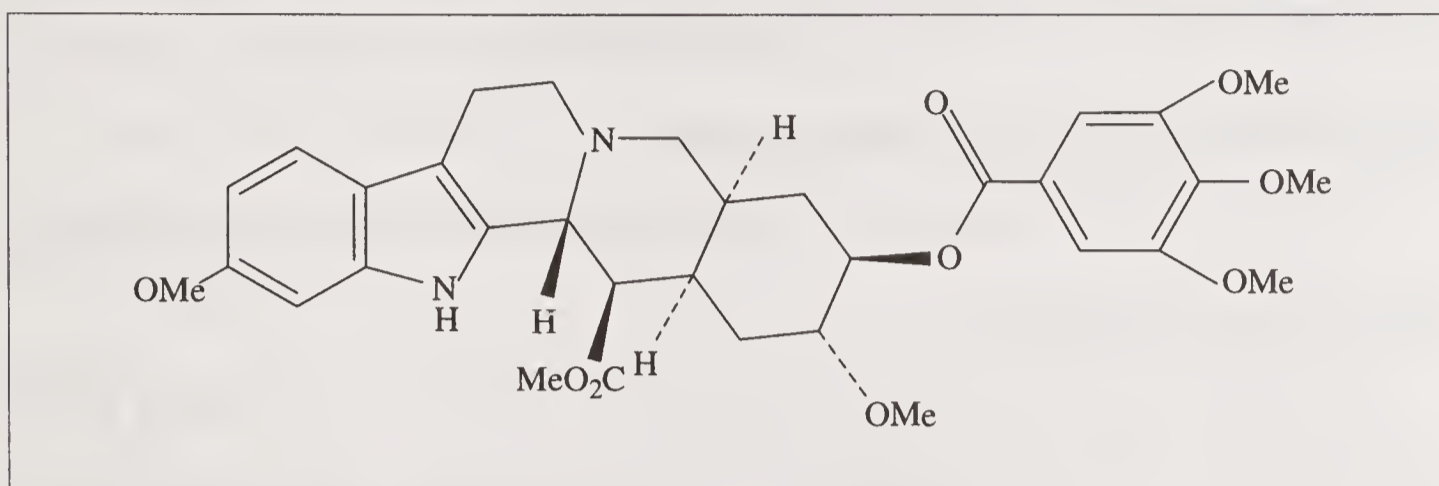


Fig 38. Structure of reserpine

Salix alba L. (Saliaceae)

S. alba is popularly known as willow. The medicinal use of willow can be traced back 6,000 years. Ancient civilizations used willow tree extracts for the treatment of pain, inflammation, and musculoskeletal diseases. In Egypt, willow was used to treat joint pains and inflammation associated with wounds. In Chinese civilizations willow was used in the treatment of fever, pain, catarrh, bleeding, goiter, and rheumatic fever. Willow has been used in North American folk medicine. Salicin (Fig 39), the active principle present in *S. alba* is chemically related to aspirin (acetylsalicylic acid).

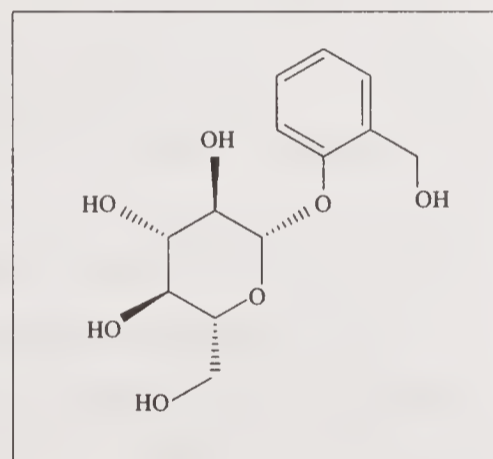


Fig 39. Structure of salicin

Taxus baccata L. (Taxaceae)

Taxus baccata is commonly known as The Pacific yew. This plant preserved and used by indigenous ethnic communities of the Pacific Island gave the million dollars worth anticancer drug taxol (Fig 40). In the Central Himalayas, the plant is used as a treatment for breast and ovarian cancer. The credit of discovery of taxol goes to Wall and Wani (1967).

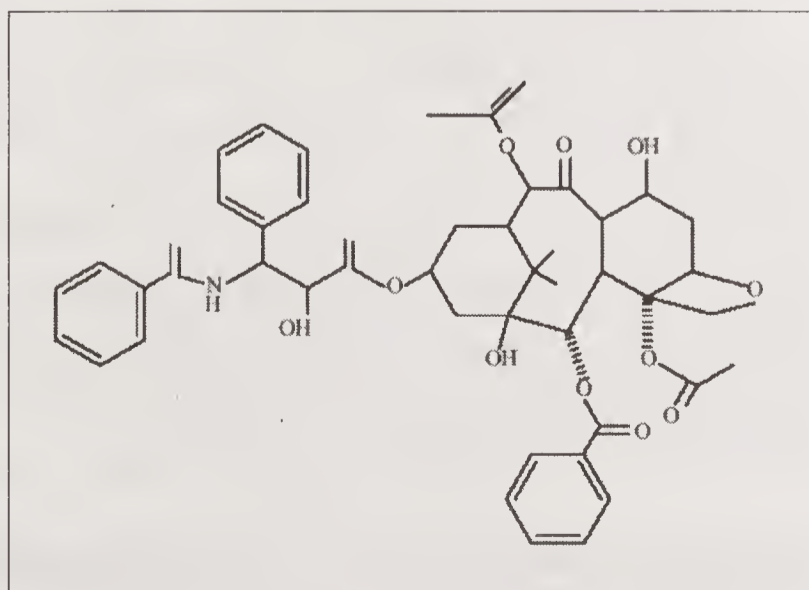


Fig 40. Structure of taxol

Important Ferns and their Folk uses as Medicines and Food

Abacopteris multilineata Ching (Thelypteridaceae)

Filtered water extract of the rhizome is useful for the patients suffering from several sorts of stomach pains.

Acrostichum aureum L. (Pteridaceae)

The rhizome is used in the treatment of furunculosis and ulcers.

Actiniopteris radiata L.

Powder of the drug along with seeds of *Ocimum americanum* is given in infertility. It finds use in Homeopathic medicine. Chenchu tribes in Nallamalais of Andhra Pradesh, use the infusion of the fern in the treatment of hypertension and tuberculosis. The same community use a powdered drug in cough.

Adiantum caudatum L. (Pteridaceae)

A. caudatum is given in diarrhoea, worm infestation, bleeding diathesis, skin diseases and fevers. Chenchu tribes use the leaf paste on burns, cuts and wounds. In Similipal in Mayurbhanj district of Odisha, India, fronds extract is used in wound healing.

Adiantum incisum Forsk. (Pteridaceae)

In Similipal in Mayurbhanj district of Odisha, India, paste of fresh or dried leaves mixed in coconut oil is used to prevent baldness. Infusion of young fronds is used in the treatment of malaria and bronchial diseases. The leaf powder mixed with butter is used for as cooling medicine.

Adiantum lunulatum L. (Pteridaceae)

Paste of *A. lunulatum* is used in plague and erysipelas. The powdered rhizomes of *A. lunulatum* are used as an antidote to snake bite. It is given in bleeding diathesis, dysentery, leprosy, fever, diarrhoea, laryngeal palsy, common cold and chronic bronchitis. Chenchu tribes use the paste of the fronds and rhizomes for a centipede bite. In Similipal in Mayurbhanj district of Odisha, India, leaf and root decoction is used for the treatment of chest complaints. Fresh leaf decoction is given to cure irregular menstrual cycle. Plant paste is given to women to help them to conceive.

Adiantum philippense L. (Pteridaceae)

Roots are used in fever, atrophy, muscular pain, diarrhoea and

rabies. Decoction of roots and rhizomes is used in dysentery, ulcers and febrile affections. In Similipal in Mayurbhanj district of Odisha, India, 2 g of fresh leaf paste is taken orally on an empty stomach, twice a day for 10 days for immediate relief from indigestion.

***Adiantum poiretii* Wikstr (Pteridaceae)**

Leaves are a remedy for cough, fever, diabetes and skin diseases.

***Adiantum venustum* L. (Pteridaceae)**

In Unani medicine, oil extracted from the fern is used as an application for hemorrhoids and scrofula.

***Alsophila glabra* Ssensu Bedd. (Cyatheaceae)**

In Similipal in Mayurbhanj district of Odisha, India, the rhizome is used against snake bite.

***Ampelopteris prolifera* (Retz.) Copel. (Thelypteridaceae)**

Fronds are alterative and mild laxative.

***Angiopteris evecta* (Forst.) Hoffm. (Angiopteridaceae)**

The rhizome paste of *A. evecta* is applied externally in case of bone fracture along with some other plants. The poultice is applied externally on the broken or fractured part of bone to get cured. Apical parts of caudex is extracted with water is applied locally over carbuncles. In Similipal in Mayurbhanj district of Orissa, India, fresh leaf paste mixed with 1 g of common salt is externally applied for early maturation of boils. The leaf paste mixed with cow ghee that is, in 5:1 ratio is locally applied for burns. Leaf extract is used in the treatment of dysentery. Spores are effective in the treatment of leprosy and other skin diseases. Part used: Rhizome.

***Araiostegia pseudocystoperis* Copel. (Davalliaceae)**

In Mt. Abu area of Rajasthan the decoction of the plant is used as vermifuge.

***Asplenium indicum* Sledge, Bull. (Aspleniaceae)**

In Similipal in Mayurbhanj district of Odisha, India, fresh rhizome paste mixed with milk is administered for treatment of gonorrhoea.

***Asplenium laciniatum* D. Don, Prod. (Aspleniaceae)**

In Similipal, in Mayurbhanj district of Odisha, India, fresh root paste along with cow urine is used for leucorrhoea. Pharmacological research: Alcoholic extract of the plant has burning effect on skin.

***Asplenium macrophyllum* Sweet. (Aspleniaceae)**

It is used in defective urination associated with beri-beri.

***Asplenium nidus* L. (Aspleniaceae)**

It is used in splenomegaly, incontinence of urine, calculus, jaundice and malaria.

***Asplenium parasiticum* (Aspleniaceae)**

It is given in splenomegaly, jaundice and urinary incontinence.

***Asplenium pumilum* var. *hymenophylloides* Fee (Aspleniaceae)**

Used in sores and ulcers.

***Asplenium ruta-muraria* L. (Aspleniaceae)**

Specific for rickets and good for premature hair fall.

***Asplenium trichomanes* L. (Aspleniaceae)**

Leaf is smoked for colds in head and chest. It is given in uterus abscess and melancholia. It is specific for rickets and good for premature hair fall.

***Botrychium lanuginosum* Wall. ex Hook and Grev (Botrychiaceae)**

Antidysenteric and antibacterial.

***Botrychium ternatum* (Thunb.) Sw. (Botrychiaceae)**

Root is prescribed in dysentery.

***Botrychium virginianum* (Botrychiaceae)**

It is applied to snake bites, bruises, cuts and sores in the Himalayas.

***Ceratopteris thalictroides* (L.) Brongn. (Parkeriaceae)**

Chenchu tribes use the leaf powder along with turmeric to unhealed wounds. In Similipal in Mayurbhanj district of Odisha, India, fresh juice of leaves is applied on fresh wounds immediately for effective stop bleeding. Fronds are used as poultice in skin diseases.

***Cheilanthes albomarginata* Clarke (Sinopteridaceae)**

It is given in tuberculosis.

***Cheilanthes farinosa* (Forssk.) Kaulf. (Sinopteridaceae)**

Chenchu tribes use the leaf powder along with turmeric to unhealed wounds. Extract of washed rhizome freed from scales is useful to the unconscious patients suffering from epilepsy.

***Christella parasitica* (L.) Lev. (Thelypteridaceae)**

In Similipal in Mayurbhanj district of Odisha, India, fresh root along with fresh root of *Asparagus racemosus* and 5 g of sugar boiled in 250 ml of water. The decoction orally administered for 10 days to cure spermatorrhoea and also used in the treatment of gout and rheumatism.

***Cyathea gigantea* (Wall. ex. Hook.) Holttum. (Hymenophyllaceae)**

Fresh rhizome mixed with *Piper nigrum* are powdered and taken orally against leucorrhoea.

***Cyathea henryi* (Bak.) Copel. (Hymenophyllaceae)**

Paste of apical soft portion of the caudex is applied to cuts and wounds for preventing blood loss.

***Cyathea spinulosa* Wall. ex Hook. (Hymenophyllaceae)**

Soft pith and roots are used for preparation of health drinks.

***Cyclosorus gongilodea* (Schkuhr.) Link (Thelypteridaceae)**

Chenchu tribes use the leaf for itching and scabies.

***Cyclosorus parasiticus* (L.) Farw. (Thelypteridaceae)**

Chenchu tribes apply the paste of rhizome over forehead to get rid of evil spirits. Pharmacological activity: Aqueous and acetone extracts of epidermal glands of *C. parasiticus* has anti-bacterial activity against *Salmonella typhi*.

***Cyrtomium falcatum* (L.f.) C. Presl. (Dryopteridaceae)**

Distribution: East Asia to Himalayas and naturalized in parts of Britain. Action: Anthelmintic. Traditional medicinal use: tapeworm infestation.

***Dicarnopteris lineris* (Burm. f.) Underwood. (Gleicheniaceae)**

Freshly extracted fronds juice is slightly heated and the decoction is taken internally during throat pain. Young fronds with cow's milk are given in female sterility.

***Diplazium esculentum* (Retz.) Sw. (Athyriaceae)**

Circinately coiled young and fresh frond is boiled with salt and taken internally for maintaining all round health. In Similipal in Mayurbhanj district of Orissa, India, decoction of fresh root along with honey is to cure spermatorrhea. Parts used: Fronds.

***Drymoglossum heterophyllum* (L.) Trimen (Polypodiaceae)**

In Tripura, paste obtained by crushing pinnae applied externally in the form of poultice on fractured bones after setting up the bones. Bamboo splints are usually tied around so as to prevent dislocation of fractured bones.

***Drynaria quercifolia* (L.) J. Sm. (Polypodiaceae)**

In Tripura, the rhizome paste mixed with molasses is taken internally for cardiac ailments. Rhizome paste is applied externally in blood coagulation.

***Dryopteris cochleata* (Ham ex D. Don) C. Chr. (Dryopteridaceae)**

Leaves are used as vegetable in dermatitis. Filtered water extract of rhizome is given to the unconscious persons suffering from epilepsy. In Similipal in Mayurbhanj district of Odisha, India, whole plant extract is given orally in snake bite. In Nepal, powdered rhizome is taken with water in rheumatism and leprosy.

***Equisetum arvense* L. (Equisetaceae)**

In folk medicine, horsetail is used for tuberculosis, as a catarrh in the kidney and urinary bladder.

***Equisetum ramosissimum* Desr. subsp. *debile* (Equisetaceae)**

Whole plant paste is externally applied to cure scabies, itches and allied skin infections. Paste of branches with leaves is used as local application for the treatment of fracture and the dislocation of bones. Younger cones powder with cold water is said to be effective in kidney troubles. Powdered stem dissolved in water is used for enema during stomach disorders in children. A powdered drug is used as aphrodisiac.

***Gleichenia linearis* L. (Gleichenaceae)**

It is bound externally onto wounds. In Similipal in Mayurbhanj district of Odisha, India, extract of whole plant is administered internally to cure infantile convulsions.

***Hemionitis arifolia* (Burm.f) Moore (Hemionitidaceae)**

Chenchu tribes use leaf extract to centipede bite and wounds. In Similipal in Mayurbhanj district of Odisha, India, root powder is taken orally with water for treatment of hypertension.

***Lycopodiella cernua* (L.) Pic. Serm (Lycopodiaceae)**

Concoction is given in beri-beri and bronchitis. The rhizome is remedy for fever, dropsy, rheumatism and nervous diseases.

***Lycopodium cernua* (L.) (Lycopodiaceae)**

Decoction of the plant is used in beri-beri as lotion, used in cough and skin eruption. Pharmacological research: Antiviral.

***Lycopodium cernuum* (L.) (Lycopodiaceae)**

Whole plant is pounded and the paste prepared to apply externally over the cut portion to reduce swelling and itching.

***Lygodium flexuosum* (L.) Sw. (Schizaeaceae)**

Extract of rhizome is used to cure gonorrhoea. In Tripura, rachis of *L. flexuosum* is tied over forehead to reduce headache.

***Lygodium microphyllum* (Cav.) R. Br. (Lygodiaceae)**

Leaf decoction is given in dysentery. Leaf poultices are applied for skin diseases and swelling.

***Lygodium scandens* Sw. (Lygodiaceae)**

Leaves mixed with leaves of *Andrographis paniculata* and rhizome of *Curcuma longa* are made into paste and applied for one week to get relief from arthritis.

***Marsilea minuta* (L.) Mant. (Marsileaceae)**

In Kumaun Himalaya, *M. minuta* is used in cough, spastic conditions of leg muscles, in sedation and insomnia. In Haluaghat and Dhobaura of Mymensingh district the Garo and Coach drink the juice of fresh shoots as a remedy for cough, respiratory troubles, especially for their babies. Juice or paste of the whole plant is applied externally on the head of patients suffering from sleeping disorder and hypertension.

***Microsorium punctatum* (L.) Copel. (Polypodiaceae)**

Leaf and juice are used as purgative, diuretic and for healing wound.

***Microsorium superficiale* (Bl.) Ching. (Polypodiaceae)**

Paste of fresh rhizome along with seeds of *Piper nigrum* is given to cure cough and cold.

***Nephrolepis biserrata* (Sw.) Schott. (Nephrolepidaceae)**

Used as vegetable.

***Nephrolepis cordifolia* (L.) Presl. (Nephrolepidaceae)**

Chenchu tribes use the fern against cough and skin diseases. The extract of fresh leaves of *N. cordifolia* is used to check bleeding of cuts and help in blood coagulation.

***Oleandra musifolia* (Bl.) Presl. (Oleandraceae)**

It is anthelmintic.

***Oleandra wallichii* Hook. (Oleandraceae)**

Rhizome is rejuvenating.

***Onychium japonicum* (Thunb.) Kunze (Pteridiaceae)**

Juice of the leaves is prescribed in alopecia.

***Onychium siliculosum* (Desv.) C. Chr (Pteridiaceae)**

Concoction of the fronds is prescribed in dysentery.

***Ophioglossum gramineum* Willd. (Ophioglossaceae)**

Decoction is beneficial in angina pectoris. Fronds used as styptic.

***Ophioglossum nudicaule* L. (Ophioglossaceae)**

Plant is used in inflammation and wounds. Fronds used as styptic.

***Ophioglossum petiolatum* L. (Ophioglossaceae)**

Thick paste of fresh rhizomes and tubers is effective in hair fall.

***Ophioglossum reticulatum* L. (Ophioglossaceae)**

Fresh leaves along with rice made into a cake and are taken against menstrual disorders. Paste of fresh leaves and tubers is applied on boils.

***Ophioglossum vulgatum* L. (Ophioglossaceae)**

When boiled in oil or fat, *O. vulgatum* is said to be a panacea for wounds and to reduce inflammation. The expressed juice of the leaves,

drunk either alone, or with distilled water of horse tail, used for internal wounds and bruises, vomiting or bleeding at the mouth or nose and sore eyes.

***Osmunda hugeliana* Presl. (Osmundaceae)**

Used in rickets, intestinal colic and rheumatism.

***Pronephrium nudatum* (Roxb.) Holttum. (Thelypteridaceae)**

Cold decoction of pinnae is used as mouthwash during acute pyorrhoea.

***Psilotum nudum* (L.) P. Beauv (Psilotaceae)**

Oily spores are remedy for infantile diarrhoea.

***Pteridium aquilinum* (L.) Kuhn (Polypodiaceae)**

Decoction of rhizome and fronds is given in worm infestation. The infusion of plant is used to relieve stomach cramps and increases urine flow. In Nepal, decoction of rhizome is used for the treatment of spleen.

***Pteridium revolutum* (Blume) Nakai (Polypodiaceae)**

Rhizome is astringent and anthelmintic. It is given in diarrhoea and inflammation.

***Pteris biaurita* L. (Polypodiaceae)**

Juice of frond is applied on cuts and bruises.

***Pteris cretica* L. (Polypodiaceae)**

Used in the treatment of wounds.

***Pteris ensiformis* Burm. (Polypodiaceae)**

It is used to control menstruation in Bougainville. In Tripura, paste of fronds is used as antiarthritic.

***Pteris multifada* (Polypodiaceae)**

Traditional medicinal uses: The fronds pounded to paste with water are applied locally around carbuncles. Pharmacological research: Anti-tumor.

***Pteris pellucida* Presl, Rel. (Polypodiaceae)**

Fresh leaf paste mixed with cow *ghee* is administered for early maturation of boils.

***Pteris quadriaurita* Retz. (Polypodiaceae)**

Fresh leaf juice is taken with 200 ml toddy (sap) obtained from *Phoenix sylvestris* is used for irregular menstrual cycle.

***Pteris semipinnata* L. (Polypodiaceae)**

Fronds pounded to paste with water are applied locally around carbuncles. Pharmacological research: Anti-tumor activity has been reported in two separate investigations.

***Pteris vittata* L. (Polypodiaceae)**

Chenchu tribes use juice for diarrhoea and dysentery.

***Pteris wallichiana* Agardh, Recens. (Pteridaceae)**

Decoction is given in dysentery and applied to glandular swellings. A roasted frond made into a paste with sesame oil is applied to skin infections of infants.

***Pyrrosia adnascens* (Forst.) Ching (Polypodiaceae)**

Cold decoction of rhizome mixed with a little powdered seeds of *Piper nigrum* is given for cough and cold.

***Pyrrosia lanceolata* (L.) (Polypodiaceae)**

Used in sore-throat.

***Selaginella bryopteris* (L.) Baker (Selaginellaceae)**

The plant is used for relief from hot wave and burning sensation during urination; restoration to normalcy of menstrual irregularities and given externally to pregnant women for an easy delivery; and for curing jaundice. The whole plant of *S. bryopteris* is mixed with roots of *Grewia hirsuta*, root of *Hemidesmus indicus*, sugar and black pepper is made into a paste. The pills are made from the paste and are given in the treatment of gonorrhoea. In Chenchu tribe's herbal practice; whole plant is used for debility.

***Tectaria cicutaria* (L.) Copel. Philipp. (Dryopteridaceae)**

Tender leaves mixed with fresh leaves of *Azadirachta indica* by adding little mustard oil is applied against eczema and scabies.

***Tectaria coadunata* (J. Smith) C. Chr. (Tectariaceae)**

Plant decoction useful in colitis. Decoction of rhizome is given to children in stomachache.

***Tectaria macrodonta* (Fee). C. Christensen (Tectariaceae)**

In Chenchu tribe's herbal practice, whole plant decoction is taken orally for stomachache. Filtered water extract of rhizome and petiole is used in constipation.

***Vittaria elongata* Sw. (Vittariaceae)**

Used in the treatment of rheumatism.

Important Gymnosperms and their Folk Uses for Medicines and Food***Abies pindrow* Royle (Pinaceae)**

Used in the treatment of chronic bronchitis and bronchial asthma. Decoction of the dried leaves is useful in case of cough, phthisis, asthma, chronic bronchitis and catarrh of the bladder and other pulmonary infections. Juice of the fresh leaves is administered in fever of infants during dentition and also in infections of the chest. Powder of leaves is given with juice of *Adhatoda vasica* and honey in cough, asthma and haemoptysis.

***Abies spectabilis* (D.Don) Spach. (Pinaceae)**

Used in the treatment of bronchial asthma, bronchitis and phthisis.

***Cedrus deodara* (Roxb.) Loud. (Pinaceae)**

Used in the treatment of chronic bronchitis, arthritis and rheumatism. The essential oil is used for application in rheumatism.

***Cupressus sempervirens* L. (Cupressaceae)**

Fruit is anthelmintic and astringent. The leaves yield an essential oil having vermifuge property. The wood is used in carpentry and for furniture making.

***Cycas circinalis* L. (Cycaceae)**

Used in the treatment of hiccough, flatulence and vomiting. Its bark and seeds ground to paste with coconut oil are used as poultice for sores and swellings. Expressed juice of tender leaves is remedy for flatulence and emesis. Sago is extracted from its stem and seeds.

***Cycas pectinata* Griff. (Cycaceae)**

Young seeds on boiling yield a decoction, which is purgative and emetic.

***Cycas rumphii* Miq. (Cycaceae)**

Resin used in the treatment of warts and malignant ulcers. It is said to be tonic and used as an expectorant.

***Ephedra gerardiana* Wall. Ex Stapf (Ephedraceae)**

Used in the treatment of hysteria, nocturnal enuresis, bronchial asthma, narcolepsy, dysmenorrhoea and common cold.

***Ephedra intermedia* Schrenk et Mey. (Ephedraceae)**

Aqueous extract is used in bronchial asthma.

***Gnetum contractum* Mgf. (Gnetaceae)**

Stems and roots are antiperiodic.

***Gnetum latifolium* Bl. (Gnetaceae)**

Stems and roots are antiperiodic.

***Gnetum ula* Brong. (Gnetaceae)**

The kernels yield oil used for massage in rheumatism.

***Juniperus communis* L. (Cuperessaceae)**

Infusion of berries is diuretic. Berries, wood and oil reported to be used in folk remedies for cancer, indurations, polyps, swellings, tumors and warts. The fruit and oil are diuretic, carminative, stimulant, and is used in dropsy, gonorrhoea, gleans, leucorrhoea and some cutaneous diseases. The berries are given in scanty urine, cough and pectoral affections. Locally, powder of berries is rubbed on rheumatic and painful swellings. Ash of the bark is applied in certain skin infections. The berries are also recommended in infantile tuberculosis and diabetes.

***Juniperus communis* L. var. *Saxatilis* Pallas (Cupressaceae)**

Its fruit is used as diuretic. Berries, wood and oil reported to be used in folk remedies for cancer, indurations, polyps, swellings, tumors and warts.

***Juniperus excelsa* M.B. (Cuperessaceae)**

Used in stomach cramps and asthma. Fruit diuretic, carminative, stimulant, used in dropsy, gonorrhoea, gleans, leucorrhoea and cutaneous diseases.

***Juniperus macropoda* Boiss (Cuperessaceae)**

Used in the treatment of chronic nephritis.

***Juniperus semiglobosa* Regel. (Cupressaceae)**

Burnt as incense in monasteries as its foliage.

***Juniperus squamata* Buch. (Cupressaceae)**

Fruit is used in stomach disorders.

***Picea smithiana* (Wall) Bois. (Pinaceae)**

Wood is used in match industry. Wood pulp used for shingles, boxes and planking. The wood is used for construction purposes and as a fuel wood.

***Pinus roxburghii* Sarg. (Pinaceae)**

Used in the treatment of worm infestation and chronic bronchitis. Resin is a stimulant. Internally it is used as stomachic and as applied as a plaster to buboes and abscesses for suppuration. Wood is diaphoretic and stimulant. Wood and oleoresin is used in snake bite and scorpion sting. It cures flatulence. Given as an enema, it cures constipation. It is commonest as liniment in rheumatic pains. Inhaling the vapors of turpentine is useful in bronchitis. The root with *Calotropis procera* is used in snake bite and scorpion sting.

***Pinus wallichiana* A.B.Jack. (Pinaceae)**

It is used for furniture and fuel purposes. Its wood is very useful and mainly used in construction and house making. It is also used in furniture and handicraft works. Its resin is stimulant and used as stomachic and as remedy for gonorrhoea. The resin is used externally applied as plaster to buboes, abscesses and broken ones for suppuration and support. Leaf extraction is used in burning of body, cough, fainting and ulceration.

***Taxus bacatta* L. (Taxaceae)**

Used in the treatment of chronic bronchitis, asthma, cough, epilepsy and indigestion.

***Thuja occidentalis* L. (Cuperssaceae)**

Dropsy and rubbed in warts, ringworm and thrush. An injection of the tincture into venereal warts is said to cause them to disappear.

Important Plants and their Folk Uses for Medicines and Food

Acacia modesta Wall (Fabaceae)

Bark and stem are used in gastric pains and protection of teeth.

Acalypha paniculata Miq. (Euphorbiaceae)

Juice of leaves is taken orally in stomachache.

Acampe carinata (Griff.) Panig (Orchidaceae)

Root and leaf paste are used internally in abdominal pain. Root paste is applied locally on scorpion sting and snake bite.

Acampe papillosa Lindl. (Orchidaceae)

Roots have expectorant property and used in treating asthma.

Acampe praemorsa (Roxb.) Blatt & McCann

Leaf juice is applied over nipple for abdominal pain, also used in earache. The whole plant is used in rheumatism. Root pastes of *A. praemorsa* and *Asparagus racemosus* are mixed together and taken orally on empty stomach to alleviate arthritis. Leaf paste is used in fracture healing.

Achasma loroglossum (Gagnep.) Larsen. (Zingiberaceae)

Rhizome is given in gum and tooth diseases.

Achillea millefolium L. (Asteraceae)

Leaves are chewed in acute toothache. Initially, it produces pungent taste, followed by cooling tingling sensation and allays the pain. The leaves and the flowering tops of the plant are used to cure gastric problems and fever. A decoction of whole plant is employed for bleeding piles.

Acogonum rumicifolium Royle (Polygonaceae)

Root is claimed to be an antidote for aconite poisoning, snake bite and scorpion sting. Paste of the root is applied to abscess and furunculosis.

Aconitum bisma (Hamilton) Rapaics (Ranunculaceae)

Tuber-paste with hot water is used in diarrhoea, dysentery, food poisoning, and anorexia. The tuber paste with honey is used in common cold, cough, bronchitis, deviation of nasal septum and sinusitis.

***Acer thomsonii* Miq (Aceraceae)**

Bark is used in the treatment of skin diseases.

***Actaea acuminata* Wall. ex Royle (Ranunculaceae)**

Root powder is used in cough.

***Adenostem malavenia* (L.) Kuntze (Asteraceae)**

Fresh leaves are used in injuries and skin diseases.

***Aerva sanguinolenta* Blume (Amaranthaceae)**

Paste of young leaves applied on fresh cuts, 2-3 times a day for 3 days.

***Aesandra butyracea* (Roxb.) Baehni (Sapotaceae)**

Fruit juice applied on the body before sleeping to soften skin; fruit edible.

***Aeschynanthus sikkimensis* (Clarke) Stapf. (Gesneriaceae)**

Decoction of root is taken in viral flue and fever. Fresh flowers are taken to cure pharyngitis and tonsillitis. The whole plant paste is used in fracture.

***Aesculus assamica* Griff. (Sapindaceae)**

The Monpa ethnic group in Arunachal Pradesh use this plant frequently to poison fish.

***Agave weghtii* Drummond & Prain (Agavaceae)**

Leaves used for the manufacture of ropes and twine. Peeled peduncle cooked as a vegetable.

***Ainsliaea aptera* DC (Asteraceae)**

Flowers are consumed for their nectar. The plant employed for fodder purposes. The root powder with lukewarm water is used in the treatment of gastric pain. It is useful in the treatment of diarrhoea.

***Aguja bracteosa* Wall. Ex Benth (Lamiaceae)**

Its roots are used to treat the snake bite. The roots are applied in the form of a paste and in the form of decoction.

***Alchemilla vulgaris* L. (Rosaceae)**

Leaves are kept in milk for half an hour and then applied to boils help in quick ripening.

***Allium auriculatum* Kunth (Alliaceae)**

Whole plant is dried and used to fry the vegetables and *dal*.

***Allium carolinianum* DC. (Alliaceae)**

Leaves are used as vegetable and flower heads are employed as condiment.

***Allium humile* Kunth. (Alliaceae)**

Fresh leaves are crushed and taken orally with milk in tonsillitis.

***Allium przewalskianum* Regel. (Alliaceae)**

Leaves are used as condiment. In snake-poisoning, bulbs are consumed with milk.

***Allium stracheyi* Baker (Alliaceae)**

Whole plant is given in the treatment of stomach-ailments.

***Allium rubellum* Beib (Alliaceae)**

It is used as vegetable and condiment.

***Allium wallichii* Kunth (Alliaceae)**

Root is given in the treatment of infection.

***Alnus nepalensis* D.Don (Betulaceae)**

Leaf paste is applied on cuts and wounds. Bark powder is used to treat burns. Decoction of root bark is used against diarrhoea and dysentery.

***Alpinia allughos* Roxb. (Zingiberaceae)**

Rhizome is appetiser and stimulant. It is given in rheumatism.

***Alpinia calcarata* Rosc. (Zingiberaceae)**

Dried rhizome is mixed with water and two drops of juice are given orally to children.

***Alpinia nigra* Gaertn. Burt (Zingiberaceae)**

In Lakhimpur district, Asom, ropes are made from leaf sheath. Rhizome extract is used as vermifuge to children. Tender shoots are roasted and eaten as curries, sold in market.

***Althernanthera pungens* Kunth (Amaranthaceae)**

Leaves are used in itching.

***Amaranthus graecizans* L. (Amaranthaceae)**

It is used to raise blisters in rheumatic pains.

***Amaranthus graecizans* subsp. *sylvestris* (Amaranthaceae)**

Leaves are used in the treatment of inflammations, hemorrhoids and gonorrhoea.

***Amorphophallus paeoniifolius* (Dennst.) Nicolson (Araceae)**

Paste prepared is applied as porridge, also baked and consumed in rheumatic swellings.

***Anaphalis margaritaceae* (L) L.N: (Asteraceae)**

Rubbed and rolled dry leaves were used in intestinal disorder. By keeping the flame of rubbed and rolled leaves on the top of the head, the heat passes slowly but continuously to the body through brain and patient gets warm and relief.

***Anaphalis triplinervis* (Sims.) C.B. Clarke (Asteraceae)**

Ventral surface of the leaves is applied locally on wound.

***Andrographis alata* (Vahl) Nees (Acanthaceae)**

A handful of fresh leaves is taken orally for snake bite.

***Andrographis lineata* Wallich ex Nees. (Acanthaceae)**

Paste of leaves is applied externally on bitten site of the scorpion and snake by the Paliyar tribes in Madurai district of Tamil Nadu.

***Androsace rotundifolia* Hardw. (Primulaceae)**

It is used as a remedy for broth controls. Extract of rhizome added to a diluted solution of common salt is used as eye drops for curing a number of ophthalmic diseases such as cataract.

***Angelica glauca* Edgew. (Apiaceae)**

Roots are used as a flavouring agent in vegetable, meat and pulses. The roots are used in treating dyspepsia and stomachache amongst the natives of Himachal Pradesh.

***Anemone rivularis* Buch.-Ham.ex (Ranunculaceae)**

Crushed juice of the tuber is applied on the affected area in cuts and wounds.

***Anodendron manubrium* (Wall.) Merr (Apocynaceae)**

Root is said to possess properties similar to those of Ipecacuanha. Leaves are used for inducing abortion by Great Andamanese tribe. Leaves contain dambonitol.

***Anthocephalus chinensis* Walp. (Rubiaceae)**

Bark decoction mixed with honey is orally taken as febrifuge.

***Anthogonium gracile* Wall. (Orchidaceae)**

Tuber/rhizome is crushed/ground into a paste and applied on the cracking heels for quick relief from pain.

***Antidesma bunius* (L.) Spreng. (Phyllanthaceae)**

Fruit is rubbed on a stone and one teaspoon of power obtained is taken with one teaspoon of honey thrice a day up to 4 days to give relief from diarrhoea.

***Aquilegia fragrans* Benth (Aquilegiaceae)**

Roots are used in kidney stones. Seed are effective in jaundice.

***Aquilegia pubiflora* Wall. ex Royle (Aquilegiaceae)**

Root sap is given as emetic. Root chewed in toothache.

***Ardisia odontophylla* Wall. (Myrsinaceae)**

Tuber crushed juice as massage over the surface in rheumatism.

***Ardisia solanacea* Roxb. (Myrsinaceae)**

Leaves are given in chest pain.

***Areca triandra* Roxb. (Arecaceae)**

Fruits are chewed and stem is used to sit during menstruation and also for post parturation.

***Arisaema triphyllum* Schott (Araceae)**

Whole crushed juice is applied over the surface as ointment in snake bite.

***Argomonía pilosa* Ledeb (Rosaceae)**

Decoction is used as alterative.

***Arisaema jacquemontii* Blume (Araceae)**

Tubers (2-3) are made into paste mixed with human saliva and applied on painful burns or boils, with beneficent results in blisters, pimples.

***Arisaema tortuosum* Schott (Araceae)**

Plant used for its insecticidal and pesticidal properties.

***Artemesia capillaris* Thunb. (Asteraceae)**

Leaf juice is extracted and is used as an ear drop. The treatment is undertaken once a day.

***Artemisia sacrorum* Ladeb (Asteraceae)**

Decoction is used in the treatment of worm-infestation.

***Artemisia scoparia* Waldest. & Kit. (Asteraceae)**

Whole plant is used as a purgative and in the treatment of burns.

***Aster tongolensis* Linn. (Asteraceae)**

Cultivated for ornamental purposes.

***Astilbe rivularis* Buch.-Ham.ex D.Don (Saxifragaceae)**

The pounded rhizome is taken with honey to cure general body pain, gastritis and constipation. Rhizome paste is taken along with honey to control excessive postpartum bleeding, diarrhoea, dysentery and is also applied over the bone fracture and dislocation or joints. Rhizome juice is useful against peptic ulcer. Leaves are chewed as a blood purifier and in toothache

***Atylosia mollis* Benth. (Fabaceae)**

Paste of the roots is used as antidote in snake poisoning.

***Atylosia volubilis* Gamble (Fabaceae)**

Bark extract is used in the treatment of dysentery and stomach-pain.

***Asparagus filicinus* Buch. Ham. (Asparagaceae)**

Roots are used in dysentery and epilepsy.

***Asparagus curillus* Buch.-Ham. Ex Roxb. (Asparagaceae)**

50 g root with 5 g zinger boiled with 250 ml milk taken orally thrice a day cures eye disease. Root powder is administered as sexual tonic and also as general tonic.

***Astragalus candolleanus* Royle (Fabaceae)**

Root powder useful in join and used as blood purifier in skin diseases.

***Asystasia gangetica* (L.) T. Anderson. (Acanthaceae)**

Fresh leaves are cooked with cumin seeds and onion bulbs and taken orally with food to stimulate the appetite.

***Avena fatua* L. (Poaceae)**

Oats consumed as human food. Plant employed as fodder for cattle.

***Aphragmus oxycarpus* (Hk.f. and Th.) Jafri (Brassicaceae)**

Powder of dried parts is used along with other ingredients to regulate urine flow.

***Aplotaxis auriculata* DC. (Asteraceae)**

Leaf paste is externally applied for venereal diseases.

***Aerva koenigii* (L.) Juss. (Amaranthaceae)**

Flowers with seeds are eaten raw to relieve bleeding piles. Leaves are used for curing liver disorders in the form of *sag* as household vegetable preparation.

***Arnebia benthamii* I. M. Jhonston (Boraginaceae)**

Decoction of rhizome in sugary water is sipped to alleviate common cold, cough and fever; also a good blood purifier.

***Argyreia hookeri* C.B. Clarke (Convolvulaceae)**

Leaves are used in the treatment of swelling and hydrocele by Great Andamanese tribe. In Sardikhola VDC, Kaski, Nepal, it is used to expel placenta in animals. If the placenta of an animal is not expelled for a long time, the plant is tied externally circling the stomach of an animal.

***Argyreia serica* Dalz. and Gibs. (Convolvulaceae)**

Leaves and fresh roots are eaten to enhance lactation. Seed powder and cow's milk is taken in fever. Tender leaves cooked as vegetable.

***Arisaema tortuosum* (Wall.) Schott (Araceae)**

Fruit paste is prepared for application in piles.

***Asphodelus tenuifolius* Cav (Liliaceae)**

Seeds are used in toothache and as diuretic agent.

***Astragalus thomsonianus* Benth. (Fabaceae)**

Powder is used for treating gastric troubles due to cold and also reduces swelling and joint pains.

***Baccuarea sapida* Muell. (Euphorbiaceae)**

Fruits are eaten.

***Bambusa nutans* Wall. ex Munro (Poaceae)**

Young shoot pounded and smeared over the bitten area in dog bites.

***Bambusa oliveriana* Gamble (Poaceae)**

Young shoot pounded and applied over affected area in injuries due to nails or any sharp things.

***Barleria gibsonioides* Blatt (Acanthaceae)**

Root paste is applied externally for healing of wounds.

***Barleria prattensis* Sant. (Acanthaceae)**

Whole plant paste is applied externally to treat paralysis.

***Begonia crenata* Dryand. (Begoniaceae)**

Fresh leaves are consumed to reduce thirstiness in summer season.

***Begonia phrixophylla* Blatt. (Begoniaceae)**

Fresh leaves are consumed to reduce thirstiness in summer season.

***Begonia picta* Smith (Bigoniceae)**

Decoction of herb is given twice a day for a week in the treatment of dyspepsia. Young leaves cooked as vegetable.

***Begonia trichocarpa* Dalz. (Begoniaceae)**

Fresh leaf juice is dropped in eye to cure opacity.

***Bellicoryne plumbaginifolia* (Acanthaceae)**

Juice of pounded bulb is given every half an hour duration (depends on the severity of bites) for snake bite. Leaf- paste is applied on the spider bitten area. Paste of bulb is applied over the head for mental disorder.

***Berchemia floribunda* Wall. (Rhamnaceae)**

The whole plant is crushed with water and the extract is used as shampoo for washing hair and dandruff.

***Betula alnoides* Buch. Ham.ex D.Don (Betulaceae)**

Stem bark paste is used to massage on sprain to get relief from pain. Stem bark paste mixed with leaves pastes of *Cissampelos pareira* is taken to cure excessive menstruation. Decoction of bark is used against post natal pain, joint pain, cough, stomachic and diarrhoea.

***Bischofia javanica* Blume. (Bischofiaceae)**

Paste of stem bark is applied externally on the affected parts in nervous diseases by the Paliyar tribes in Madurai district of Tamil Nadu.

***Bistorta amplexicaulis* Greene (Polygonaceae)**

Hot infusion of root is used as tea.

***Blepharis maderaspatensis* (L.) Roth. (Acanthaceae)**

Leaf paste is mixed with the powdered black gram, crushed onion and white yolk of one egg and the mixture is applied topically over the fractured bones by the Paliyar tribes in Madurai district of Tamil Nadu. Paste of leaves is mixed with lime juice and applied on cuts.

***Blepharis persica* (Burm.) Kuntze (Acanthaceae)**

Leaves and roots are used in liver and urinary diseases.

***Blumea hieracifolia* DC. (Asteraceae)**

Crushed leaves are applied over the injuries.

***Blumea mollis* (D.Don) Merr. (Asteraceae)**

Plant extract in two spoonsful twice a day for about week day's controls jaundice.

***Blumeopsis arborea* (D.Don) Merr.(Asteraceae)**

Cloth is soaked in crushed juice and placed over the required area in case of fever.

***Boehmeria nevia* Hook & Arn. (Urticaceae)**

Stem bark is used as thread and fibre.

***Boenninghausenia albiflora* Hook. (Rutaceae)**

Poultice of the aerial plant parts is used for healing wounds. Juice of whole plant is applied externally to cure headache, pain in eyes.

***Borreria hispida* (L.) Schumann (Rubiaceae)**

Leaves are used in tooth and gum disorders.

***Breynia rhamnoides* Muell. (Euphorbiaceae)**

Root and leaves paste is used in the treatment of white patches on the skin all over the body.

***Brugmansia suaveolens* (Humb. and Bonpl. ex Willd.) Bercht. and J. Pres (Solanaceae)**

The powdered dried leaves (8-10 g) and flowers mixed with powdered black pepper prescribed twice with honey for treating cough.

***Brunella vulgaris* (Lamiaceae)**

Herb is considered as antiseptic, expectorant, antirheumatic, alternative tonic, astringent carminative, antispasmodic and is used in fever and cough.

***Bulbophyllum neilgherrense* Wight (Orchidaceae)**

Fine paste of the pseudo bulb and leaves is administered orally for leucoderma.

***Bulbophyllum odoratissimum* Lindl. (Orchidaceae)**

Whole plant infusion or decoction is used in fracture healing and treatment of tuberculosis.

***Bulbophyllum sterile* (Lam.) Suresh (Orchidaceae)**

Pseudo bulbs are used to prepare medicated coconut oil for external application in rheumatism.

***Butea buteiformis* (Voigt) Grierson and D. G. Long (Fabaceae)**

Seed pulp containing a single seed is roasted and taken for expulsion of tape worms and worm from the stomach and intestine.

***Caesalpinia decapetala* (Roth.) Alston**

Oil extracted from seeds is applied locally to heal cattle wounds.

***Caladium bicolor* Vent. (Araceae)**

Tuber juice is given in snake bite.

***Calamus macracanthus* T. Anders. (Arecaceae)**

Juice of crushed leaves used as an eye drop cures eye infection and other eye diseases.

***Calanthe triplicate* (Willem.) Ames (Orchidaceae)**

Whole plant is used in abdominal pain. Roots are chewed along with betel nuts and other aromatic substances in diarrhoea and dysentery.

***Callicarpa arborea* L. (Verbenaceae)**

One spoon of the stem-bark paste mixed with a tuber paste of *Rauvolfia serpentina* is taken with half cup of water twice a day till cure.

***Canarium euphyllum* Kurz (Burseraceae)**

C. euphyllum is commonly known as White dhup. It is an evergreen tree and exploited for timber. It is found in Andaman and Nicobar Islands, Myanmar and Thailand. Onges tribe uses the resin of the plant to repel the insects. It has been found to be effective against rheumatoid arthritis.

***Canarium manii* King. (Burseraceae)**

C. euphyllum is found in Andaman forests. It has been found to be effective against rheumatoid arthritis. As far as chemical composition is concerned, the plant contains a bioflavonoid, agathisflavone (Fig 41), which is hepatoprotective activity in experimental studies. It has been found to be effective against rheumatoid arthritis.

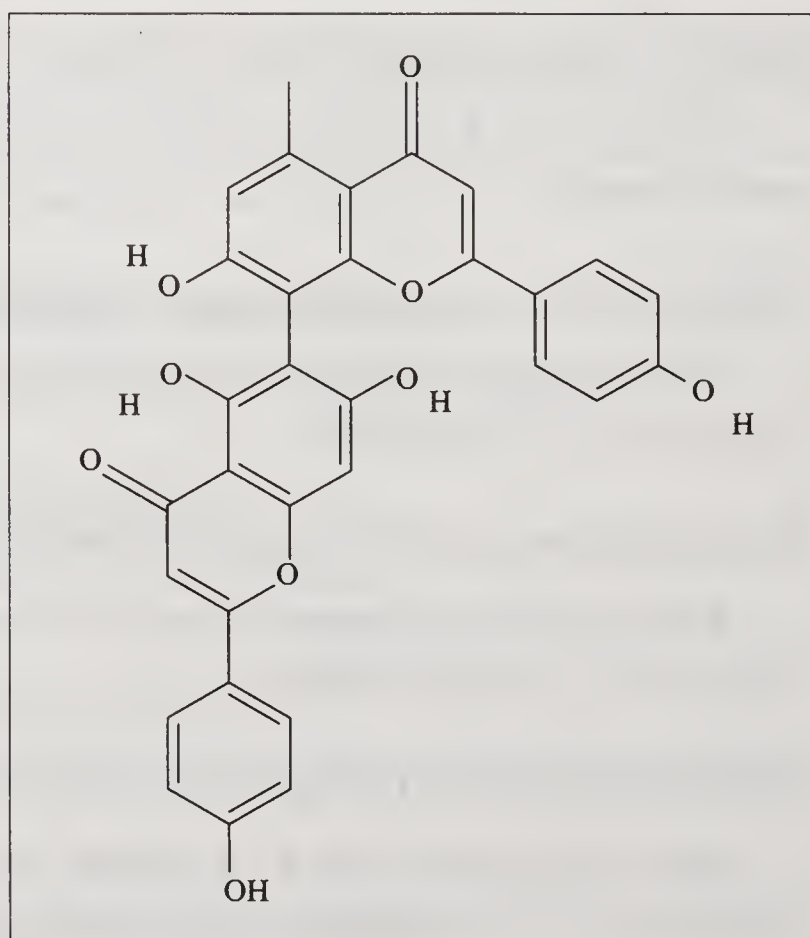


Fig 41. Structure of agathisflavone

***Cardiospermum canescens* Wall. (Sapindaceae)**

Juice prepared from 10 g of leaves with 50 ml of water is taken orally on an empty stomach for a period of 2 days in a single dose to arrest dysentery.

***Carex muricata* L. (Cyperaceae)**

In Lakhimpur district, Asom, rhizome is used in the marriage ceremony.

***Carmona retusa* (Vahl) Masam. (Boraginaceae)**

To induce fertility, the juice of the leaves is taken internally for three to four months.

***Carissa opaca* Stapf ex Haines (Apocynaceae)**

Root paste is used for the treatment of stomach pain.

***Carya illinoensis* (Wang.) K. Koch. (Juglandaceae)**

Roots and stem-bark are used in skin diseases.

***Caryota mitis* Lour. (Arecaceae)**

Young shoots are used in vomiting and stomachache.

***Caryota urens* L. (Arecaceae)**

Nut powder made into paste applied to the head and bath is taken after one hour for dandruff.

***Casearia elliptica* Willd (Flacourtiaceae)**

Leaf juice poured into eyes for ophthalmic infections.

***Cassiope fastigiata* (Wall.) D. Don (Ericaceae)**

In case of minor burns, fresh leaves are crushed and a thick paste is made. A thick paste is applied externally on the affected parts.

***Celtis australis* L. (Ulmaceae)**

Paste of root applied on cuts and wounds. Young branches relished by cattle.

***Ceropegia candelabrum* L. (Asclepiadaceae)**

Paste of leaves is applied on forehead in headache by the Paliyar tribes in Madurai district of Tamil Nadu.

***Chenopodium botrys* L. (Chenopodiaceae)**

Vegetable, prepared from tender shoots and leaves is found effective to cure severe headache. Used in catarrh and humoral asthma. Used as diuretic, laxative, anthelmintic, cures headache, stomachache and liver complaints. A soup prepared from the leaves is prescribed for gastric disorders.

***Chloroxylon swietenia* DC. (Flindersiaceae)**

Stem bark paste is used as an external application on wounds. In yoke gall, paste of stem bark ash mixed with *Pongamia pinnata* oil is applied over the affected area.

***Chromolaena odorata* L. (Asteraceae)**

Leaf is used in the treatment of cuts and wounds by Great Andamanese tribe.

***Chrysanthemum leucanthemum* L. (Asteraceae)**

Expressed juice of the leaves is applied to wounds and cuts.

***Cicerbita macrorhiza* (Royle) Beauverd (Asteraceae)**

Juice of fresh leaves is drunk and root paste rubbed on the forehead to treat headache.

***Cipadessa baccifera* (Roth.) Miq. (Meliaceae)**

Paste of leaves is mixed with a cup of water or milk and taken orally in the treatment of diarrhoea by the Paliyar tribes in Madurai district of Tamil Nadu. The leaf juice is (50 ml) taken orally to arrest dysentery.

***Cirsium verutum* (D. Don) Spreng. (Asteraceae)**

The root (100 g) boiled with 500 ml water is prepared as a 50 ml decoction which is further mixed with 1-2 spoonful of devdar oil and applied externally on joints to treat rheumatism.

***Cirsium wallichii* DC. (Asteraceae)**

Peeled stem and roots are eaten raw.

***Cissus rependa* Vahl. (Vitaceae)**

Tender leaves are used as vegetable for stomach diseases.

***Cissus adnata* Roxb. (Vitaceae)**

Leaf boiled extract is orally taken in case of urinary stone.

***Cissus repens* Lamk. (Vitaceae)**

Tender leaves are used as vegetable; remedy of muscular pain and stomach disorders.

***Cissus vitiginea* L. (Vitaceae)**

During conjunctivitis, stem bark paste with pepper powder and kusuma oil is used as an external application. In anthrax, stem bark decoction is administered orally, while stem-bark paste is applied externally on wounds.

***Clausena dentata* (Willd.) Roem. (Rutaceae)**

Paste of leaves is applied over the affected parts on wounds.

***Clematis barbellata* Edgew. (Ranunculaceae)**

Leaves are crushed either with water or cow urine, and the paste is applied on pimple and boil eruptions to treat the infected part.

***Clematis connata* DC. (Ranunculaceae)**

Leaves are chewed in diabetes.

***Clematis montana* Buch.-Ham. ex. DC. (Ranunculaceae)**

Leaf extract is used half teaspoonful twice a day, early in the morning and at night after meals for three months in diabetes. Leaves lopped for fodder.

***Clematis nutans* Royle (Ranunculaceae)**

Infusion of the leaves is used as errhine.

***Clenogyne dichotoma* Salisb. (Zingiberaceae)**

Stem bark is used in weaving mats.

***Cochlospermum religiosum* (L.) Alston (Cochlospermaceae)**

Stem bark is ground into paste and plastered over for bone fractures.

***Coelogyne cristata* Lindl. (Orchidaceae)**

Boiled extract of the bulb is used orally before going to bed to control abortion.

***Coelogyne stricta* (D.Don) Schltr. (Orchidaceae)**

Pseudobulb used to treat fever and headache.

***Colutea nepalensis* Sims. (Fabaceae)**

Leaves are purgative and seeds are emetic.

***Clinopodium vulgare* L. (Lamiaceae)**

4-5 g powdered dried leaves and flowers prescribed twice daily for stomachache and dysentery.

***Coldenia procumbens* L. (Boraginaceae)**

Leaf paste is bandaged over swelled joints.

***Colebrookea oppositifolia* Smith (Lamiaceae)**

Leaf paste applied to wounds and sores twice a day. The leaf juice is applied on the forehead for the treatment of headache and fever. The leaves are used to arrest bleeding. Dry leaves used as an adulterant for tobacco.

***Coleus malabaricus* Benth. (Lamiaceae)**

In case of asthma, leaf paste is applied on chest or vapour of the leaves boiled in water is inhaled.

***Coleus parviflorus* Benth. (Lamiaceae)**

Paste of the tuber along with *neem* leaves is applied to skin to reduce itching and boils.

***Commelina benghalensis* L. (Commelinaceae)**

In Lakhimpur district, Asom, tender leaves and shoots are eaten cooked as vegetable. Paste is made from stem and leaves and used in bone fracture, curry made of tender shoots and flesh of *Channa orientalis* (chengeli) is given in irregular menstruation (1 tea spoonful twice daily till cure).

***Commelina padulosa* Blume (Commelinaceae)**

Decoction of the plant with water is used in the treatment of sexual impotency in men. Paste is prepared from roots and is applied externally against boils.

***Conyza canadensis* L. (Asteraceae)**

Whole plant is used in inflammations and asthma.

***Conyza japonica* Less. (Asteraceae)**

Crushed leaves are applied over the surface in case of scabies.

***Corallocarpus epigaeus* Rottl.ex.wild (Cucurbitaceae)**

Root paste is used on swellings.

***Corbichonia decumbens* (Forrsk.) Jacq (Molluginaceae)**

Crushed leaves are used orally in urinary diseases.

***Cordia grandis* Roxb. (Boraginaceae)**

Fruit decoction is orally taken in case of urinary infections.

***Coronopus didymus* (L.) Smith (Brassicaceae)**

Aerial parts are used as a vegetable.

***Corydalis moorcroftiana* Wall. ex Hk.f. and Th. (Fabaceae)**

Fresh leaves and flowers are collected and dried in shade and powdered. The powder is consumed with water to cure pain and swelling in the bones.

***Cordia oblique* Willd. (Cordiaceae)**

During body pain, fruit paste is used as an external application while the fruit paste is administered daily once for a fortnight during general debility. In case of diarrhoea, stem bark decoction is administered thrice daily.

***Costus igneus* Nak (Costaceae)**

Consumption of the leaves is believed to lower blood glucose levels.

***Cotinus coggygria* Soep (Anacardiaceae)**

Sap is applied for wound-healing.

***Cousinia thomsoni* C. B. Clarke (Asteraceae)**

About 2-2.5 g of root powder is taken regularly to cure swellings and joint pains.

***Crassocephalum crepidioides* (Benth.) S. Moore (Asteraceae)**

Crushed leaves applied to the cut area as antiseptic.

***Crataeva unilocularis* (Buch-Ham.) (Capparidaceae)**

Stem bark is used in urinary diseases.

***Crepis flexuosa* (DC.) Benth. (Asteraceae)**

Fresh juice of the plant mixed with equal amount of water is taken once a day to cure jaundice.

***Crossandra nilotica* Oliv. (Acanthaceae)**

Leaves are used in veterinary medicine, miscellaneously it is poisonous and repellent and used as an antidote to venomous stings and bites.

***Croton bonplandianum* Bailon. (Euphorbiaceae)**

Seeds are used as purgative.

***Croton scariosus* Bedd. (Euphorbiaceae)**

Decoction of leaves is used in the treatment of convulsions.

***Croton sparsiflorus* Morung (Euphorbiaceae)**

For blood clotting, 7-8 leaves are crushed in the palm and its juice is applied.

***Cymbidium aloifolium* (L.) Sw. (Orchidaceae)**

Leaf juice mixed with salt or juice from the pod is used to treat earache. The paste prepared from the aerial root paste of this plant is used for joining fractured bones.

***Cyperus aromaticus* (Ridl.) Mattf. and Kukenthal. (Cyperaceae)**

In Lakhimpur district, Asom, tubers are medically used in skin diseases.

***Cypripedium pubescens* Willd. (Orchidaceae)**

It is used in diabetes, diarrhoea, dysentery, paralysis, convalescence, impotence and malnutrition.

***Cyperus brevifolius* L. (Cyperaceae)**

Roots are used as purgative.

***Curcuma caesia* Roxb. (Zingiberaceae)**

Rhizome is used in haemorrhoids, cancer, tumors, AIDS and tuberculosis. Its decoction is also used in fever and food poisoning.

***Curcuma inodora* Blatt. (Zingiberaceae)**

Tuber paste prepared in oil is applied externally in the treatment of muscular pain.

***Cuscuta europaea* L. (Cuscutaceae)**

Plant sap is given approximately half teaspoonful twice a day, for a week as carminative. Plant extract is applied externally on affected area, twice a day for 14 to 28 days to treat psoriasis. The plant is used in rituals, and religious ceremonies.

***Cuscuta hyalina* Roth. (Cuscutaceae)**

The plant is used in chest pain.

***Cyathula tomentosa* (Roth) Moq. (Amaranthaceae)**

Leaf extract is used as emetic. The whole plant extract is warmed, and used thrice a day for a week in the treatment of eye ailments. Extract of root is used approximately a tablespoonful thrice a day, for a month, in haematuria. Leaf and bark paste along with cow's urine is applied on the affected area, thrice a day for 30-45 days Herpes zoster.

***Cynoglossum glochidiantum* Wall. ex. Benth (Asteraceae)**

Expressed leaf juice is used as eye drops in conjunctivitis.

***Cyperus aromaticus* Ridl. (Cyperaceae)**

Tubers are used in skin diseases.

***Dactyloctenium aegyptium* (L.) P. Beauv. (Fabaceae)**

Juice of the fresh plant is used in fever.

***Dactylorhiza hatagirea* (D.Don) Soo. (Orchidaceae)**

It is used in diabetes, diarrhoea, dysentery, paralysis, convalescence, impotence and malnutrition.

***Dahlia rosea* Cav. (Asteraceae)**

Whole plant is used as snuff in disease of nose.

***Dalbergia paniculata* Roxb. (Fabaceae)**

In postnatal complaints, stem bark extract is administered with a pinch of pepper powder daily once for one week. For treating baldness and dandruff, paste of dry stem bark powder mixed with *neem* oil is applied.

***Daphne cannabina* Wall. (Thymelaeaceae)**

Root is crushed and the boiled juice is given during food poisoning. Raw leaves are fed to baby goats during diarrhoea and fever. Traditional paper is made from the bark and the stalks are used to weave mats.

***Daphne papyracea* Wall. ex Steud. (Thymelaeaceae)**

Expressed juice is administrated orally twice daily in hypertension.

***Delima sarmentosa* L. (Dilleniaceae)**

Stems are used for potable water.

***Dendrobium crumenatum* Sw. (Orchidaceae)**

Leaf poultice is applied on the boils and pimples, also used in nervous system disorders and nervous debility.

***Dendrobium densiflorum* Lindl. ex. Wall. (Orchidaceae)**

Leaf paste is applied to fracture healing.

***Dendrobium herbaceum* Lindl. (Orchidaceae)**

Leaf paste is applied on the infected parts of syphilis, tender leaf juice is used in earache.

***Dendrobium macraei* Lindl. (Orchidaceae)**

Root paste taken on an empty stomach along with black pepper cures skin allergy and is also applied externally on eczema, used in snake bite and snake bite wounds. Fruit and whole plant are aphrodisiac.

***Dendrobium macrostachyum* Lindl. (Orchidaceae)**

Tender leaf tip juice is used in earache.

***Dendrobium nobile* Lindl. (Orchidaceae)**

Fresh and dried stem is aphrodisiac and analgesic. Pseudo bulb extracts cures eye infections and soothe burns.

***Dendrobium normale* Fale (Orchidaceae)**

Whole plant is aphrodisiac and tonic.

***Dendrobium ovatum* Kranzl. (Orchidaceae)**

Fresh plant juice is used in stomachache and acts as laxative.

***Dendrobium regium* Prain (Orchidaceae)**

Plant crushed in *karanj* oil (*Pongamia pinnata*) is used in skin diseases.

***Deeringia amaranthoides* (Lamk.) Merr. (Amaranthaceae)**

Leaves are cooked with salt to treat liver disorders by some

villagers. Dye from fruits and seeds are prepared for colouring the clothes and attires in some areas of Mandi district in Himachal Pradesh.

***Descurainia sophia* (L.) Webb ex Pren (Brassicaceae)**

Young shoots and seeds are powdered and used for gastric trouble and intestinal disorders. The decoction is used as a painkiller. Freshly collected leaves are taken with milk for reducing high fever.

***Desmodium pulchellum* (Linn.) Benth. (Fabaceae)**

In wounds, the leaves and tubers ground with the bark of *Moringa oleifera* and green banana and the paste is applied on the affected areas.

***Desmodium umbellatum* (L.) DC. (Fabaceae)**

Leaves are used in fever.

***Dicentra thelictrifolia* (Wall) Hk.f and Th.(Fumariaceae)**

Taking water boiled with crushed root stops excessive bleeding in females.

***Dichroa febrifuga* Lour. (Hydrangeaceae)**

D. febrifuga is an important plant as it is reputed febrifuge. Local people in Nepal and India consume decoction of the leaves in the treatment of fever. It is reputed antimalarial in Traditional Chinese Medicine. Febrifugine (Fig 42), isofebrifugine and γ -dichorine are important alkaloids.

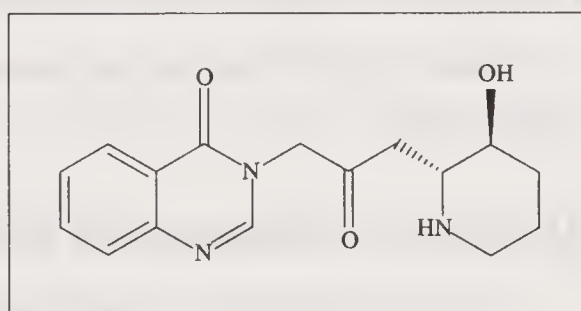


Fig 42. Structure of febrifugine

***Dichrocephala integrifolia* (L.f.) Kuntze (Asteraceae)**

The crushed extract is applied over the affected area.

***Dicliptera bupleuroides* Nees (Acanthaceae)**

Decoction of seed or leaves with water is given orally to children in dysentery.

***Dicliptera roxburghiana* Nees (Acanthaceae)**

Flowers used for offerings and ornamental purposes. A poultice of the plant is good against bites of wasps and bees.

***Digera arvensis* L. (Amaranthaceae)**

Leaves are used in weak bones and infections.

***Digera muricata* (L.) Mart. (Amaranthaceae)**

During constipation, leaves used as a vegetable; for kidney stones, tender tips extract is administered daily once until cured.

***Dioscorea hispida* Denst. (Dioscoreaceae)**

Boiled tubers are taken twice a day for 15 days to cure piles. The paste of the corm along with warm mustard oil is applied for the treatment of rheumatism and gout.

***Dioscorea kumaonensis* Kunth. (Dioscoreaceae)**

Tubers are consumed as a vegetable in cases of leucorrhoea.

***Dioscorea oppositifolia* L. (Dioscoreaceae)**

Boiled root tubers are taken orally to reduce body heat.

***Dioscorea pentaphylla* L. Dioscoriaceae)**

Boiled rhizome is very fibrous and thus used as anthelmintic and vermifuge especially against tapeworm.

***Diospyros chloroxylon* Roxb. (Ebanaceae)**

Juice of the leaves in two spoonful is given for three days to cure diarrhoea.

***Diospyros melanoxylon* Roxb. (Ebenaceae)**

Leaf and bark is used in the treatment of diarrhoea and dysentery.

***Dipsacus inermis* Wall. (Dipsacaceae)**

In case of pain, the leaves are boiled in water and the resulting extract is used by ladies for taking bath after delivery. In sore throat, the extract of leaves is taken twice a day for 5-8 days.

***Docynia indica* (Colebr.) Decne (Rosaceae)**

In case of urinary ailments, fruit infusion with sugar kept for two weeks and orally taken.

***Dolichandrone atrovirens* (Roth) Sprague (Bignoniaceae)**

In ephemeral fever, extract of the stem bark crushed with those of *Anogeissus latifolia* is used orally. During oedema, paste of bark crushed with *Hygrophila auriculata* leaves, pepper, garlic, turmeric and common salt is used as a pickle.

***Dracaena angustifolia* Roxb. (Dracaenaceae)**

Leaf juice is used internally in the treatment of stomach pain. Twigs are used to clean genitals during the menstruation period.

***Dracocephalum heterophyllum* Benth. (Lamiaceae)**

Juice of the fresh leaves and flowers is filtered and used in treating eye diseases like irritation, burning sensation and pain. It helps to control various eye diseases. Flower powder is given for eye ailments.

***Drimia indica* L. (Liliaceae)**

The plant is used for inducing abortion.

***Duabanga grandiflora* (Roxb.) Walp. (Sonneratiaceae)**

Fruit juice extract is given in ringworm and warts.

***Duchesnea indica* (Andr.) Focke (Rosaceae)**

Leaf juice is used in the treatment of cataract, constipation and dyspepsia.

***Dysophylla quadrifolia* Benth. (Lamiaceae)**

In case of chickenpox, dried leaves are burnt and the patient is exposed to the fumes and leaf paste is also applied to the body.

***Echinops cornigerus* DC. (Asteraceae)**

Whole plant is used in childhood insanity.

***Echinops niveus* Wall. (Asteraceae)**

Tablets derived out of powdered root bark, mixed with honey is prescribed in asthma.

***Eleutherococcus cissifolius* Griff. ex C. B. Clarke (Araliaceae)**

One or two handful bundles of fresh leaves are boiled and taken for stomach disorder.

***Embelia nutans* Wall. (Myrsinaceae)**

Leaves are used for fermentation of country liquor.

***Emilia sonchifolia* (L.) DC. (Asteraceae)**

Leaf paste in doses of one spoonful once a day at bed time for about 2-3 months to treat night blindness.

***Endostemon viscosus* (Roth) M. Ashby. (Lamiaceae)**

Leaf juice is applied externally to repel ticks.

***Entada pursaetha* ssp. *sinohimalensis* Grierson and Long (Mimosaceae)**

Juice or paste of crushed bark is applied externally to cure skin diseases. Paste of seeds is applied to cure mumps. Seed powder is mixed with water for cleansing hair, and as an anti-dandruff agent.

***Epipactis latifolia* Wall. (Orchidaceae)**

Rhizomes relieve nervous system disorders and is aphrodisiac.

***Eranthemum roseum* (Vahl.) R. Br. (Acanthaceae)**

Expressed root juice is used in the treatment of stomachache.

***Eremurus himalaicus* (Asphodelaceae)**

Young leaves are used as vegetables in case of anemia.

***Eria muscicola* Lindl. (Orchidaceae)**

Pseudo-bulbs are used in heart troubles and ear problems.

***Erigeron borealis* (Vierch.) Simmons (Asteraceae)**

Leaves are dried under shade and powdered. The powder along with other ingredient is taken as an antidote in food poisoning.

***Erigeron multiradiatus* Benth. (Asteraceae)**

Juice of fresh leaves is taken with equal quantity of water to get relief from burning sensation in the stomach.

***Eryngium foetidum* (L.) (Asteraceae)**

Leaf juice is used on forehead in headache.

***Eucalyptus hybridum* L. (Myrtaceae)**

Juice of crushed fresh leaves and tender stems applied on cuts and wounds; its poultice applied on forehead to check headache due to high fever.

***Eucalyptus polybractea* R. T. Baker (Myrtaceae)**

Leaves paste is used along with *Curcuma longa* L. to cure the skin disease.

***Eulophia campestris* Wall. ex Stapf (Orchidaceae)**

Tuber is used in scrofulous glands of neck, heart troubles, intestinal worms, sexual debility and other sexual disorders. Also used in purulent cough and acts as a nervine tonic.

***Eulophia explanata* Lindl. (Orchidaceae)**

Pseudobulb crushed with pepper and garlic is applied on wounds and is used in impotence and other sexual disorders.

***Eulophia nuda* Lindl (Orchidaceae)**

It is given in worm infestation and scrofula.

***Eulophia ochreatea* Lindl. (Orchidaceae)**

Powder of tubers mixed with jaggery is given to increase stamina.

***Eulophia spectabilis* (Dennst.) Suresh (Orchidaceae)**

Leaf decoction is used against worms.

***Eupatorium adenophorum* Spreng. (Asteraceae)**

Expressed leaf-juice is used to arrest bleeding. The young leaf paste is applied to wounds and also used to rub on the sprained parts to relieve pain and swelling.

***Eupatorium birmanicum* (DC.) (Asteraceae)**

Young shoots and leaves are used in the treatment of epilepsy. Crushed fresh juice is taken orally in gastroenteritis.

***Eupatorium cannabium* L. (Asteraceae)**

Leaf and stem extract is used to cut and bruises to stop bleeding and infection

***Euphorbia acaulis* Roxb. (Euphorbiaceae)**

E. acaulis is found in Tropical Himalayas. Caudicifolin and 3-oxoatisane-16 α , 17-diol have been reported. The tubers are traditionally used by the Malayali tribes of Chitteri hills, Eastern Ghats, Tamil Nadu to treat liver disorders. The plant collected from Madhya Pradesh has been found to be effective against rheumatoid arthritis. In a clinical study, 18 out of 23 patients reported beneficial effect in eczema with 50 mg of powdered drug.

***Euphorbia geniculata* Ort. ex Boiss (Euphorbiaceae)**

Leaf paste used to cure leucoderma.

***Euphorbia heleosopia* L. (Euphorbiaceae)**

Paste of the plant applied for healing wounds. Leaf juice (5-10 ml) mixed with honey is used for persistent cough.

***Euphorbia heterophylla* L. (Euphorbiaceae)**

It is used as galactagogue.

***Euphorbia prolifera* Buch. Ham. ex. Don (Euphorbiaceae)**

Powdered fruit is used in the treatment of dog bite.

***Euphorbia rothiana* Spreng. (Euphorbiaceae)**

Its latex is applied externally for healing sores. It is also believed to promote hair growth. The whole plant is good insect repellent.

***Evodia fraxinifolia* Hook. f. (Rutaceae)**

Ripe fruit is boiled to crush and the paste is applied on the forehead during giddiness; chewing raw or dried fruit treat indigestion. Fruits are also used to make chutney.

***Excoecaria acerifolia* Didr. (Euphorbiaceae)**

In case of stomach worm, paste is prepared from roots for external application.

***Excoecaria crenulata* L. (Euphorbiaceae)**

Paste of the stem is applied on the affected part of the skin.

***Fagopyrum dibotrys* D. Don (Polygonaceae)**

Leaves are consumed as leafy vegetable to pacify numbness and tingling sensation of extremities, fever and to prevent urolithiasis.

***Ferula jaeschkeana* Vatke (Apiaceae)**

Powder prepared from the dried parts is consumed daily with water to cure chest pain. It controls rheumatism, toothache, wounds and used as spice.

***Ficus dalhousiae* Miq. (Moraceae)**

Bark paste is applied externally to mend cracks in the feet.

***Ficus mollis* Vahl. (Moraceae)**

Bark paste is applied as an ointment for cuts and wounds.

***Ficus palmata* Forsk (Moraceae)**

It is commonly known as ‘Fegra Fig’ or ‘Wild Himalayan Fig’. It is used as supplementary food by The Gaddis. The whole fruit, along with the seeds, is edible. The unripe fruits and young growth are cooked and eaten as a vegetable. They are boiled, the water is removed by squeezing and they are then fried. The chemical composition of Wild Himalayan fig is tabulated below (Table 8).

Table 8. Chemical composition of Wild Himalayan

Constituent	Content (%)
Total sugars	6
Pectin	0.2
Protein	1.7
Ash	0.9
Phosphorus	0.034
Potassium	0.296
Calcium	0.071
Magnesium	0.076
Iron	0.00

Source: Joshi, Prasad and Juyal (2014)

***Ficus semicordata* Buch.-Ham. ex Sm. (Moraceae)**

In case of alopecia, milky latex is applied.

***Filipendula vestita* (Wall. ex G. Don) Maxim. (Rosaceae)**

Leaf paste is applied for wound healing.

***Flemingia chappar* Benth. (Fabaceae)**

Tender stem is used as toothbrush to clean the teeth.

***Flemingia involucrata* Benth. (Fabaceae)**

Leaves and flowers are used as insect-repellent.

***Flemingia strobilifera* R. Br. (Fabaceae)**

Root decoction is used in cough, fever and bronchial disorder.

***Fimbristylis spathacea* Roth (Cyperaceae)**

Fresh root is taken in snake bite.

***Fragaria indica* Andr. (Rosaceae)**

Ripe fruits are edible.

***Fragaria nubicola* Lindely ex Lacaita (Rosaceae)**

Rhizomes are used to cure tonsillitis. Fresh rhizome ground to a fine powder and mixed with sugar (2-5 mg daily) for a month.

***Galinsoga parviflora* Cav. (Asteraceae)**

Leaf decoction mixed with honey is orally taken in diarrhoea and dysentery.

***Galium asperifolium* Wall. (Rubiaceae)**

Whole plant is ground in water and used in worm infestation.

***Galium rotundifolium* Wall. (Rubiaceae)**

It is used in abdominal pain, sore throat and chest problems.

***Galium verum* L. (Rubiaceae)**

Expressed juice is used in hysteria and fits.

***Gardenia resinifera* Roth (Rubiaceae)**

Mixture of resin and sugar in hot milk is used to arrest diarrhoea.

***Garcinia cowa* Roxb. (Clusiaceae)**

Fruits are used in the treatment of dysentery.

***Garcinia lanceaefolia* Roxb. (Clusiaceae)**

Fruits are used in the treatment of diarrhoea.

***Garuga pinnata* Roxb. (Burseraceae)**

Bark juice is applied to treat dislocated bones and to heal wounds. The root bark is used in the treatment of skin diseases.

***Gastrodia elata* Blume (Orchidaceae)**

Stalk is aphrodisiac, dried plant and tuber relieves headache and also used in nervous system disorders and nervous debility.

***Geodorum densiflorum* Schlechter (Orchidaceae)**

Tuber powder mixed with cow's *ghee* is employed to treat dysentery.

***Geranium ocellatum* Camb (Geraniaceae)**

Powder of the plant is used as insecticide.

***Givotia rotteleriformis* Griff. (Euphorbiaceae)**

Stem bark is ground with salt, pepper and garlic and the mixture is used to cure fever.

***Genderusa vulgaris* Nees. (Acanthaceae)**

Leaves are used in the treatment of rheumatism.

***Gentiana paludosa* Hook. (Gentianaceae)**

It is used in the treatment of skin diseases and fever. In hysteria and weakness, decoction of the bark is used.

***Gentiana tenella* (Roltb) H. Smith (Gentianaceae)**

In hysteria and weakness, decoction of the bark is used.

***Gentiana tianschanica* Rupr. (Gentianaceae)**

It is used as a substitute for *G. kurroo*.

***Gentiana tubiflora* (G. Don) Griseb. (Gentianaceae)**

Fresh plant juice is mixed with equal quantity of water and about half glass of the mixture is taken orally in morning hours to cure jaundice.

***Gentianopsis detonsa* (Rottb.) Ma. (Gentianaceae)**

Fresh leaves and flowers are crushed to extract the juice. The juice is taken orally to cure jaundice and also for purification of blood.

***Geum elatum* Wall. (Rosaceae)**

It is effective remedy in the treatment of cuts and wounds.

***Girardinia diversifolia* (Link) Friis (Urticaceae)**

Leaf crushed juice is applied externally to relieve swollen joints.

***Girardinia heterophylla* Decne. (Urticaceae)**

In case of snake bite, the whole plant is swept on the affected part.

***Girardinia zeylanica* Decne. (Urticaceae)**

Leaves are used for curbing inflammation.

***Glinus lotoides* L. (Molluginaceae)**

The plant is used in urinary diseases.

***Globba marantina* L. (Zingiberaceae)**

In fever, tuber paste is applied on the scalp to lower high temperatures.

***Glochidion oblatum* J. D. Hooker (Euphorbiaceae)**

Fresh stem and roots extracts are taken for dysentery.

***Gnaphalium luteoalbum* L. (Asteraceae)**

Roots are aromatic in nature, used in *havans*. Leaves are astringent, diuretic and haemostatic.

***Gnaphalium uliginosum* C.B. Clarke (Asteraceae)**

Twig decoction is used as gargle in mouth ulcers.

***Gomphrena celosoides* Martius (Amaranthaceae)**

The expressed juice of whole plant along with *Piper nigrum* and lemon juice is given in the treatment of nephrolithiasis.

***Goniothalamus sequipedalis* Hook.f. and Thoms. (Annonaceae)**

Leaf boiled extract is used to bath new born child as antiseptic.

***Gouania leptostachya* DC (Rhamnaceae)**

Paste of leaves is applied to cure sores and inflammation.

***Grangea maderspatana* (L.) Poir. (Asteraceae)**

Leaf extract is used as antispasmodic.

***Grevillea robusta* A. Cunn. ex R.Br. (Proteaceae)**

Paste of fresh leaves is boiled in vegetable ghee. Mixed properly with coconut oil and applied externally on burn scars twice a day for ten days.

***Grewia abutilifolia* Vent. ex A. L. Juss. (Tiliaceae)**

Bark juice is used in dysentery.

***Grewia aspera* Roxb (Tiliaceae)**

In the treatment of diarrhoea, bark is dried, powdered and then boiled with water and consumed at regular intervals for 3 days.

***Gymnadenia orchidis* Lindl. (Orchidaceae)**

Root is useful in gastric, gonadic and urinary complaints.

***Gymnocladus assamicus* Kanjilal ex P.C. Kanjilal (Fabaceae)**

The Monpa ethnic group in Arunachal Pradesh use *G. assamicus* as

disinfectant for cleaning wounds and parasites like leeches and lice on livestock.

***Gynura bicolor* (Roxb. and Willd) DC. (Asteraceae)**

One or two handful of leaves along with the young stems is boiled with or without rice and is taken for treating gastritis/chronic acidity and blood pressure. The crush of the fresh leaves is squeezed and the juice is mixed with water and taken fresh for ulcer and abdominal cleansing.

***Gynura cusimbua* D.Don (Asteraceae)**

Stem and leaves are used for stopping bleeding and faster healing and cure headache.

***Gynura nepalensis* (DC.) (Asteraceae)**

Young stem and flower against stomach ulcer.

***Habenaria commelinifolia* Wall ex Lindl. (Orchidaceae)**

Tuber is used in snake bite and snake bite wounds. Root is used to treat fever and the whole plant is used in nose bleeding.

***Habenaria crinifera* Lindl. (Orchidaceae)**

Whole plant relieves headache.

***Habenaria edgeworthii* Hook.f. ex Collett. (Orchidaceae)**

It is used in diseases of blood.

***Habenaria hollandiana* Sant. (Orchidaceae)**

Tubers are used in rituals.

***Habenaria intermedia* D.Don (Orchidaceae)**

It is used in diseases of the blood.

***Habenaria marginata* Coleb. (Orchidaceae)**

Tuber decoction with honey on an empty stomach is administered in malignant ulcer.

***Habenaria pectinata* D.Don. (Orchidaceae)**

Leaves are crushed and applied on snake bites. Tubers mixed with condiments are used in arthritis.

***Habenaria repens* Nuttall. c**

Tuber decoction acts as aphrodisiac.

***Habenaria roxburghii* Nicolson in Salda. (Orchidaceae)**

Tubers are eaten daily morning breakfast before to control burning micturition and diabetes. Tuber decoction is applied on snake bite.

***Habenaria susannae* (L) Rafin. (Orchidaceae)**

Tubers are used in blebs or bullae on palm.

***Haplanthodes verticillata* (Roxb.) R.B. Majumdar (Acanthaceae)**

Powder of seeds mixed with cow-milk is used to increase the stamina.

***Hedychium acuminatum* (Roscoe) Wall. (Zingiberaceae)**

Root powder is used in indigestion.

***Hedychium coronarium* (J. Koenig) (Zingiberaceae)**

Rhizome is used in cough and vomiting.

***Hedychium greenii* W.W. Smith (Zingiberaceae)**

Rhizome decoction is mixed with honey and orally taken in leucorrhoea.

***Hedychium marginatum* (C. B. Clarke) (Zingiberaceae)**

Rhizome is used in bronchitis and stomach ulcer.

***Hedyotis diffusa* Willd. (Rubiaceae)**

Decoction of the plant is recommended in intermittent fever.

***Hedyotis pinnifolia* L. (Rubiaceae)**

Whole plant is used in the treatment of dysentery.

***Hedyotis scandens* Roxb. (Rubiaceae)**

The Monpa ethnic group in Arunachal Pradesh use *H. scandens* as growth supplement during the preparation of fermented starter cultures.

***Henckelia incana* (Vahl) Spreng. (Gesneriaceae)**

Leaf is ground in water and the juice is taken orally to treat fever.

***Heracleum lanatum* Michx. (Apiaceae)**

Dried root is powdered and mixed with water. A thin paste is applied on the affected parts. The treatment is undertaken once a day for 1-2 weeks.

***Heracleum wallichii* DC. (Apiaceae)**

Powder of root is used in erectile dysfunction. Fruits are taken against stomach disorders, cough, cold and bodyache. Dried fruits are chewed to treat sinusitis and influenza. Root juice is taken to cure diarrhoea; seeds are locally used as *chatni*.

***Heritiera littoralis* Dryand (Sterculiaceae)**

Leaves are used in preparation of ongetea, a stimulant drink.

***Heynea trijuga* Roxb. (Meliaceae)**

In tooth disorders, stem branches are used as tooth brush and help to reduce tooth disorders.

***Hibiscus talbotii* (Rakshit) Paul & Nayar (Malvaceae)**

Extract of the root is used in dyspepsia.

***Hibiscus tiliaceus* L. (Malvaceae)**

Leaves are used in stomach diseases by Great Andamanese tribe.

***Hippophae tibetana* Schlecht. (Elaeagnaceae)**

Dried berries are crushed and boiled in water and the decoction obtained is taken as tea to cure cough, congestion, jaundice and also as a blood purifier.

***Hodgsonia macrocarpa* (Bl.) Cogn. (Cucurbitaceae)**

Seeds are used as anti-fertility agents.

***Holmskioldia arboretum* Retz. (Verbenaceae)**

Twig pounded and mixed with oil and applied to head in headache and dizziness.

***Homonoia riparia* Lour (Euphorbiaceae)**

Root extracts in doses of two spoonful twice a day for 2 weeks to treat piles.

***Horsefieldia glabra* (Bl.) Warb (Myristicaceae)**

Fruits are used in abdominal pain.

***Horsfieldia kingi* (Hook.f.) Warb. (Myristicaceae)**

Nuts are edible and stimulant.

***Houttuynia cordata* Thunb. (Saururaceae)**

Leaves and tender shoots are used in the treatment of dysentery. Crushed juice is spread over the affected area in muscular sprain.

***Hoya lanceolata* Wall. (Asclepiadaceae)**

Paste of leaves and latex is applied in furunculosis and pain of muscular origin.

***Hybanthus enneaspermus* (Linn.) F. Muell. (Family: Violaceae)**

The plant is used as an aphrodisiac, demulcent, tonic, diuretic, anti-convulsant and antimalarial and used to treat urinary infections, diarrhoea, leucorrhoea, dysuria, inflammation and male sterility. Siddha medical practitioners from Radhapuram taluk of Tirunelveli district, Tamil Nadu, use this plant as aphrodisiac. The plant is used by some tribe in Odisha to cure diabetes.

***Hydrocotyle javanica* Thunb. (Apiaceae)**

In Lakhimpur district, Asom, about 20 g plants pounded with equal amount of tender leaves of *Psidium guajava* and the extracted juice is given in amoebic dysentery.

***Hydrocotyle sibthorpioides* (Apiaceae)**

Plant juice is used in fever and root juice of the plant with *Musa sapientum* is used in piles.

***Hydrolea zeylanica* (Hydrophyllaceae)**

In Lakhimpur district, Asom, leaves and shoots are used as antiseptic in cuts and wounds.

***Hydrilla verticillata* L. (Hydrocharitaceae)**

In Lakhimpur district, Asom, whole plant is used as fertilizer and water purifier.

***Hypericum cernuum* Roxb. (Hypericaceae)**

Seeds are used for flavoring curries. Seed oil massaged for quick relief of rheumatism.

***Hypericum choisianum* Wall. ex N. Robson (Hypericaceae)**

Fresh decoction of the root and leaves is used orally in the morning before meal for three months in the treatment of leucorrhoea.

***Hypericum japonicum* Thunb. ex Murray (Hypericaceae)**

Powder of whole plant is used as snuff in nose diseases.

***Hypericum oblongifolium* Choisy (Hypericaceae)**

Powdered flowers are given in the treatment of jaundice. Paste of leaves and flowers applied on forehead for headache.

***Hypericum patulum* Thunb (Hypericaceae)**

Seeds are aromatic and stimulant.

***Hyssopus officinalis* Linn. (Lamiaceae)**

The plant is used to cure colds, cough and lung complaints. Flower tops are also used as substitute of saffron.

***Impatiens sulcata* Wall. (Geraniaceae)**

The whole plant is ground to have a paste and applied over skin cracks and eruptions for healing.

***Indigofera aspalathoides* Vahl. Ex DC. (Fabaceae)**

Traditionally, the plant is used for ailments such as cancer, oedema, abscess and skin disorders. Siddha medical practitioners from Radhapuram taluk of Tirunelveli district, Tamil Nadu, use this plant in the treatment of skin diseases.

***Indigofera cassioides* Rottl. ex DC. (Fabaceae)**

Flowers and roots mixed and ground into a paste with water are used to cure dysentery. Roots with bark juice of *Careya arborea* is used as a remedy for blood dysentery.

***Indigofera heterantha* Grahm (Fabaceae)**

Brush is made out of one year old branches which is used for toothache.

***Indoneesiella echioides* (L.) Sreemadh. (Acanthaceae)**

Leaves are used in gastric ulcers, respiratory system infections, fever, itches and as antipyretic and carminative.

***Inula cuspidata* Clarke (Asteraceae)**

Decoction of fresh roots (5-10 ml for 5 days) given empty stomach for expelling worms.

***Inula royleana* Hook DC. (Asteraceae)**

Roots are stored for its aroma and used for protection of garments. Root extract is used to cure dermatitis and allergy. Root paste is also applied with leaf on swelling sprains and as an antiseptic by villagers in Kangra district of Himachal Pradesh.

***Ipomoea aquatica* Forsk (Convolvulaceae)**

In Lakhimpur district, Asom, tender leafy shoots are eaten fried or cooked. About 30 to 50 ml of leaf extract is orally taken to control bleeding during childbirth.

***Ipomoea mauritiana* Jacq. (Convolvulaceae)**

Flowers are used as a stimulant.

***Ipomoea obscura* (L.) Ker. - Gowl. (Convolvulaceae)**

During acute stomachache, the leaf extract is administered. In horn cancer, leaf decoction in gingelly (*Sesamum indicum*) oil is administered daily.

***Ipomoea pes-tigridis* L. (Convolvulaceae)**

Root is used in urinary retention, constipation, and gynaecological disorders.

***Ipomoea staphylina* Roemer & Schult. (Convolvulaceae)**

Decoction of leaves and bark is given to get relief from stomach disorders.

***Iris ensata* Thunb. (Iridaceae)**

About 10 g seed powder is consumed orally to kill the worms in the stomach. It is alterative, purifies blood, and cures venereal infections, liver complaints, and dropsy.

***Iris hookeriana* Foster (Iridaceae)**

Yields an essential oil used in perfumery, rich source of ascorbic acid. Extract of roots is used to treat frozen feet. It is also grown in graveyards as a rodent repellent.

***Iris kumaonensis* Auct. (Iridaceae)**

Root and leaf crushed juice is applied as poultice over the forehead in fevers.

***Ixeris sagittarioides* (C.B.Clark) Stebb. (Asteraceae)**

Decoction of the root is used in the treatment of snake bite.

***Jacaranda mimosifolia* L. (Bignoniaceae)**

Leaf juice applied for healing wounds. The plant is grown for ornamental purposes.

***Jasminum mesnyi* Hance (Oleaceae)**

Leaves are mostly used in the treatment of diabetes, muscular pain and in anorexia.

***Jussiea repens* L. (Onagraceae)**

Tender leaves are used as vegetable.

***Justicia betonica* L. (Acanthaceae)**

Root paste is administered in 2 spoonful twice a day for 5 days to treat muscular pains.

***Justicia tranquebariensis* (Acanthaceae)**

Leaf powder has the ability to control the blood sugar level.

***Jurinea ceratocarpa* (DC.) Benth. (Asteraceae)**

Dried roots are crushed to derive a black powder, which is mixed with *ghee* for use as "*kajal*" for better eye vision.

***Knema andamanica* (Warb.) deWilde (Myristicaceae)**

Bark is used in throat pain and cough.

***Kunstleria keralensis* Prain (Fabaceae)**

K. keralensis is found in the southern Western Ghats of India. It is reported that the bark of the plant is used as a medicine to relieve body pain and also had antifertility activity. The plant would have become untraceable had the tribals not protected it in a sacred grove in coastal Kerala.

***Kydia calycina* Roxb. (Malvaceae)**

Leaves are used as anti-rheumatic agent.

***Lactuca macrorhiza* Hook. f. (Asteraceae)**

Plant powder along with other ingredients is used to cure stomachache.

***Lactuca rapunculoides* (DC.) Clarke (Asteraceae)**

Sap of young leaves mixed with equal quantity of water is taken to cure severe stomach pain and cramps for immediate relief.

***Lagotis glauca* Gaertn. Var. *Cashmeriana* Hook. F. (Selaginaceae)**

Roots of the plant are used in the same way as the root of *Picrorhiza kurroa*. It is very often used as an adulterant to *P. kurroa*.

***Lannea coromandelica* (Hutt.) Merr (Anacardiaceae)**

Stem bark is ground with garlic and the paste is given to cure fever.

***Lantana wightiana* Wall. ex Gamble (Verbenaceae)**

Leaf juice is given to children before food for easy digestion.

***Lasia spinosa* Thwaites. (Araceae)**

Tender leaves are used as vegetable. Root is used in throat problems; boiling root juice is used in piles.

***Lasianthus andamanicus* Hk. f. (Rubiaceae)**

Fruits are used as antidote to poisons.

***Launea procumbens* Roxb. (Asteraceae)**

Whole plant is useful in tooth diseases, diabetes, constipation, intestinal disorders, painful urination, and gonorrhoea, relief in cold, cough, flu and wound infection.

***Lavatera kashmeriana* Camb. (Malvaceae)**

Paste of dried flowers in milk is used for the treatment of mumps in children.

***Leonotis nepetifolia* (L.) R. Br. (Lamiaceae)**

Plant ash is used to cure paralysis; plant paste used in skin diseases. Leaf paste is applied locally to cure joint pain.

***Lepidagethis trivernis* (Acanthaceae)**

Bark decoction mixed with honey is given orally to treat cough.

***Lepidium latifolium* Linn. (Brassicaceae)**

Powder of dried leaves and flowers is taken daily with water to cure joint pains. Depurative and antiscorbutic, cure skin diseases and rheumatism. Powder of aerial parts is used to cure rheumatic pain.

***Leptodermis lanceolata* Wall. Vern. (Rubiaceae)**

Bark paste applied externally on the forehead twice a day to treat migraine. Leaves browsed by livestock, stem used for fuel.

***Leucas biflora* (Vahl.) R.Br. (Lamiaceae)**

In skin irritation, paste of the whole plant is mixed with the coconut oil and applied extensively on the affected areas.

***Leucas lanata* Benth. (Lamiaceae)**

Leaf paste is applied externally on septic wounds and also to check bleeding and heating.

***Leucas lavandulaefolia* Roes (Lamiaceae)**

Paste of tender shoots is applied to forehead to relieve headache. Extracted leaves juice is applied to the nostril of sinus patient.

***Leucas mollissima* Wall. (Lamiaceae)**

Poultice of fresh leaves applied to cure sores, headache, wounds and bites of poisonous insects.

***Leucas plukenetii* (Roth) Spreng (Lamiaceae)**

Leaves are used in sinusitis.

***Limnophila heterophylla* Benth. (Scrophulariaceae)**

Leaf juice is taken orally in case of eye diseases.

***Lindera neesiana* (Wall ex Nees) Kurtz. (Myrsinaceae)**

The Monpa ethnic group in Arunachal Pradesh use this plant in the treatment of tapeworm and roundworm infestation. The seeds are crushed and taken with water to stop vomiting sensation.

***Lindernia cordifolia* Colsm. Merr. (Scrophulariaceae)**

Leaves are used in gonorrhoea.

***Lindernia crustacea* (L.) F.V. Mueller (Scrophulariaceae)**

In Lakhimpur district, Asom, whole plant is used in dysentery and

ringworm. Decoction of herb is used $\frac{1}{2}$ teaspoonful twice a day for 7 to 21 days for the treatment of abdominal ailments. Paste of herb with cow's urine is applied on cuts and wounds for early healings.

***Lindelofia longiflora* (Royle ex Benth.) Bail. (Boraginaceae)**

Ash of leaves is applied on cuts and wounds for checking bleeding and quick healing.

***Litsaea polyantha* Juss (Lauraceae)**

Ointment prepared from powder of bark and leaves is used in the treatment of injuries.

***Litsaea umbrosa* Nees. (Lauraceae)**

Ointment prepared from powder of bark and leaves is used in the treatment of bone-injuries.

***Lobelia heyneana* Roem. & Schult. (Lobeliaceae)**

Leaves and flowers are mixed with water and the paste is applied on skin till cure.

***Lobelia pyramidalis* Wall. (Lobeliaceae)**

Decoction is used in the treatment of liver diseases.

***Lonicera angustifolia* Wall. (Caprifoliaceae)**

Paste of the leaves is used in application to furunculosis.

***Ludwigia adscendens* L Hara. (Onagraceae)**

In Lakhimpur district, Asom, tender shoots are eaten fried or cooked with other vegetables. Paste of leaves is applied locally on fresh cuts as antiseptic, juice is useful in dysentery.

***Lyonia ovalifolia* (Wall.) Drude Vern (Ericaceae)**

Young shoots and leaves are made into paste, which is applied externally on affected area, twice a day (14 to 28 days) for the treatment of eczema. Seed paste applied on wounds and boils. Wood used as fuel. Leaves lopped for manure.

***Macropanax undulatum* Seem. (Araliaceae)**

Bark is administered against diabetes.

***Macrotyloma uniflorum* (Lam.) Verdc. (Fabaceae)**

In kidney stones, 250 g of seeds are boiled with 1 liter of water and seeds used in pulse continuously for 7 days.

***Maianthemum purpureum* (Wall.) La Frankie (Asparagaceae)**

50 g dried leaves are fried in 4-5 spoonsful of *Prunus persica* oil.

***Malaxis acuminta* D.Don (Orchidaceae)**

It is used in bleeding diathesis, burning sensation, fever and phthisis.

***Malaxis muscifera* (Lindl.) Kuntze (Orchidaceae)**

It is used in bleeding diathesis, burning sensation, fever and phthisis.

***Mallotus peltatus* (Geisel) Muell (Euphorbiaceae)**

Green leaves are placed or tied on genital parts in menstrual pain.

***Malva neglecta* Wall. (Malvaceae)**

Decoction of leaves prescribed for asthma and cough.

***Malvastrum coromandelianum* (L.) Garcke (Malvaceae)**

Leaves applied for healing wounds and inflamed sores.

***Malaxis densiflora* (A. Rich.) Kuntze (Orchidaceae)**

Leaf paste is spread on the wound for quick healing of wounds.

***Marsdenia brunoniana* Wight & Arn. (Asclepiadaceae)**

Leaves are dried in shade and their powder is taken for diabetes.

***Megacarapea polyandra* Benth. ex Madden (Brassicaceae)**

Root powder is used in fever and stomachache.

***Melanorrhoea usitata* Wall. (Anacardiaceae)**

Resin is spread over the affected area in leprosy.

***Melothria maderaspatana* Cogn. (Cucurbitaceae)**

In case of chronic cough, the stem is crushed and the juice is taken for 3 days for effective results.

***Melothria perpusilla* (Blume.) Cogn. (Cucurbitaceae)**

Leaves and fruits are used in jaundice and kidney infections.

***Memecylon umbellatum* Burm. f. (Melastomataceae)**

Leaves are used to depress the appetite.

***Meriandra benghalensis* (Roxb.) Benth. (Lamiaceae)**

Leaves are used in cough and dizziness.

***Meyna laxiflora* Robyns (Rubiaceae)**

Fresh leaves are used with dry fish (a fermented form of fish), with a little common salt and chilli as a blood purifier. Dry fruits are eaten for boils and dysentery.

***Micromeria biflora* (Buch.-Ham. ex D.Don) Benth. (Lamiaceae)**

Dried powder of the plant is used in eczema.

***Mikania cordata* (Burm.f.) B.L. Rob. (Asteraceae)**

Decoction is orally taken in case of snake bite.

***Mikania micrantha* H.B.K. (Asteraceae)**

Paste of whole plant is used in the treatment of cuts, wounds and insect bites.

***Millettia pachycarpa* Benth. (Fabaceae)**

Root extract (juice) is applied over the affected area in case of scabies.

***Millettia racemosa* (Roxb.) Benth. (Fabaceae)**

In fits, one spoon of stem bark paste is administered with half glass of water daily once till cure.

***Miliusa velutina* (Dunal) Hook. f. & Thom. (Annonaceae)**

Slender twigs are used as a toothbrush for cleaning the teeth.

***Mimosa hamata* Willd. (Fabaceae)**

The plant is used as a tonic.

***Mitracarpus villosus* (Sw.) DC. (Rubiaceae)**

Leaf paste is applied externally to treat wounds.

***Mollugo nudicaulis* Lam. (Molluginaceae)**

Siddha medical practitioners from Radhapuram taluk of Tirunelveli district, Tamil Nadu, use this plant as febrifuge.

***Morchella esculenta* (L.) Pers. (Morchellaceae)**

Decoction of fruit is used in cough and cold.

***Morina longifolia* Wall. ex DC. (Morinaceae)**

Decoction of whole plant is administered orally for curing diseases.

***Morus nigra* L. (Moraceae)**

Fruit is used as anthelmintic.

***Mucuna gigantea* DC. (Fabaceae)**

Gently beaten shoots tied around body parts in sprain.

***Mucuna macrocarpa* Wallich (Fabaceae)**

Seed powder taken with water helps remove roundworm from stomach.

***Myristica andamanica* Hook. f. (Myristicaceae)**

Leaves and twigs are used in sickness and to stop hemorrhage.

***Mussaenda frondosa* L. (Rubiaceae)**

Leaf paste of the crushed leaves is applied to the broken bones.

***Musa velutina* Wendl. & Drude (Musaceae)**

One or two fresh leaves are warmed up gently near the fire and dabbed on the affected part of the sore lips before going to bed.

***Mussaenda roxburghii* Hook. f. (Rubiaceae)**

Pounded bark juice is applied over the area of snake bite.

***Neanotis sahayadrica* Billore & Mudaliar (Rubiaceae)**

Expressed leaf juice is put in cattle's ear in case of snake bite.

***Nepeta ciliaris* Benth. (Lamiaceae)**

Fresh leaves are used as insecticidal agent.

***Nepeta discolor* Royle ex Benth. (Lamiaceae)**

In tuberculosis, 150 ml decoction of dried leaves is mixed with 2-3 spoonful of honey.

***Nepeta hindostana* (Roth) Haines (Lamiaceae)**

Boiled root extract is given orally in the morning before meal for one month in the treatment of menorrhagia.

***Nepeta longibracteata* Benth. (Lamiaceae)**

The plant is used in hyperacidity.

***Nepeta podostachys* Benth. (Lamiaceae)**

It is used in the treatment of fever and cough.

***Neurada procumbens* L. (Fabaceae)**

The plant is used as a tonic.

***Nicotiana plumbaginifolia* Viviani, Vern. & H. (Solanaceae)**

Leaf paste along with cow's urine is applied on cuts and wounds for early healing. Leaf paste applied on tongue to check excessive growth and Herpes zoster. Dried leaves and seeds are used as substitute of tobacco.

***Oenanthe javanica* (BL) DC (Apiaceae)**

In Lakhimpur district, Asom, shoot and whole plant are used as vegetable. The plant extract is used in mild fever.

***Ophiopogon intermedius* D.Don (Haemodoraceae)**

Tuber decoction is orally taken in case of dropsy.

***Orchis latifolia* L. syn *Dactylorhiza hatagierea* (D Don) Soo. (Orchidaceae)**

Tuberous root decoction is useful in abdominal pain, root is used in diarrhoea and dysentery, chronic fever, as aphrodisiac and as nervine tonic. It is also useful in arthritis, gout and tones up genito-urinary functions, boiled extract of tuber mixed with milk is given in fracture healing.

***Orchis laxiflora* Lam. (Orchidaceae)**

Bulb is expectorant and also used in bronchitis.

***Orchis mascula* L. (Orchidaceae)**

Root powder is cooked with milk in the proportion of one teaspoonful to a teacupful of milk for chronic diarrhoea and dysentery, also used in nervous system disorders and nervous debility and is aphrodisiac. Its tuber controls diabetes.

***Origanum vulgare* L. (Lamiaceae)**

The paste of the leaves and terminal shoots along with 2-3 black pepper is applied on boils, cuts, wounds, ulcers and eczema. The leaf paste is applied on burns.

***Osbeckia stellata* Wall. (Melastomaceae)**

Juice of crushed twig is mixed with honey and orally taken in menstrual complaints.

***Ottelia alismodes* L. Pers (Hydrocharitaceae)**

In Lakhimpur district, Asom, leaves are used as poultice.

***Oxalis corymbosa* L. (Oxalidaceae)**

Leaves are used in the treatment of dysentery.

***Oxalis viridis* L. (Oxalidaceae)**

In Lakhimpur district, Asom, whole plant is used in stomach disorder. It is grown as ornamental plant also.

***Oxyria digyna* (L.) Hill (Polygonaceae)**

The plant is used as antiscorbutic and refrigerant.

***Oxytropis lapponica* (Wahl) Gay. (Fabaceae)**

Whole plant is boiled in water and the water is applied externally to treat joint pain.

***Paeonia obovata* Max. (Paeoniaceae)**

It is commonly known as Japanese forest peony. The Ainu people used this plant, called horap or orap, as a painkiller. In India, *P. obovata* has been collected from the Western Ghats. It has been found to be effective against rheumatoid arthritis.

***Pandanus andamanensis* Kurz (Pandanaceae)**

Leaves are used in body pains.

***Parasassafra confertiflora* (Meisner) Long (Lauraceae)**

Oil extracted from seeds is used by local people for medicinal and edible purpose in Bhutan. Cotton soaked in oil is used to arrest bleeding.

***Parkia roxburghii* D.Don (Mimosaceae)**

Freshly taken or boiled pods are consumed in constipation.

***Parietaria debilis* Forst. (Urticaceae)**

Crushed slimy roots are used as soap by women for washing hair.

***Parrotiopsis jacquemontiana* (Decne.) Rehder (Hamamelidaceae)**

Oil is extracted from the stem which is applied to affected area. The leaves are crushed and applied on wounds for 2 to 3 days.

***Parthenocissus quinquefolia* (L.) Planch. (Vitaceae)**

Fruit extract juice with sugarcandy is orally taken as liver tonic.

***Passiflora calcarata* Mast. (Passifloraceae)**

In skin-diseases, leaf juice is applied externally.

***Passiflora foetida* L. (Passifloraceae)**

Leaves are used in the treatment of breathing problem of horses.

***Pedilanthus tithymaloides* (L.) Pit. (Euphorbiaceae)**

The Mishing community of North East India use local application of latex in the treatment of piles. Leaves are used as anti-venom for cobra poison.

***Pentanema indicum* (L.) Ling (Asteraceae)**

During insect bite, leaf juice is used as a lotion. Root extract taken daily once in three days during menstrual period acts as an antifertility agent in women.

***Peristrophe paniculata* (Forsk.) Burm.f. (Acanthaceae)**

Paste of leaves and roots applied externally in rheumatic pain.

***Phlebophyllus kunthianum* Nees. (Acanthaceae)**

In nervous disease, fresh leaves and bark are heated with gingelly oil and applied externally on the affected part of the body by the Paliyar tribes in Madurai district of Tamil Nadu.

***Pholidota chinensis* Lindl. (Euphorbiaceae)**

Pseudobulbs are used in duodenal ulcer, scrofulous glands of neck and toothache. Pseudobulb tincture is used in bronchitis.

***Pholidata imbricata* L. (Euphorbiaceae)**

Pseudobulb extract is used in abdominal pain and rheumatism. Leaf and root paste is applied externally for healing fractures.

***Pholidata pallida* Lindl. (Euphorbiaceae)**

Bulb is used in intestinal worms and abdominal pain. Root is used in rheumatism.

***Phyllanthus indofischeri* Bennet (Phyllanthaceae)**

A handful of tender leaves mixed with honey is given to children to arrest dysentery.

***Phytolacca acinosa* Roxb. (Phytolaccaceae)**

The roots are harvested during the autumn season, dried and powdered. The powder is used to cure boils, sores, carbuncles.

***Picris hieracioides* L. (Asteraceae)**

Leaves are used as febrifuge.

***Pieris ovalifolia* (Ericaceae)**

Leaves either crushed or mixed with water are rubbed on the body to reduce inflammation, irritation and allergies.

***Pimpinella diversifolia* DC. (Apiaceae)**

A paste of flowers, roots and leaves is taken with water.

***Plectranthus rugosus* Wall. (Lamiaceae)**

The juice of leaves is dropped in earache.

***Pleurospermum angelicoides* (Wall. ex DC.) Benth. ex C.B. Clarke (Apiaceae)**

For treatment of dyspepsia, 50 g of root paste is mixed with 20 g of dried leaves of *Allium* spp. and fried with 3 spoonful of ghee.

***Pleurospermum brunonis* Benth (Apiaceae)**

In skin diseases, the dry flowers are powdered and mixed with water to make thick paste. A thin layer is applied on the affected part of the skin.

***Pleurospermum stylosum* Benth. ex Cl (Apiaceae)**

All parts including roots are dried under shade and powdered.

Small tablets (about 2-5 g) prepared from the powder are given to pregnant ladies to reduce the pain during delivery.

***Pimpinella diversifolia* DC (Apiaceae)**

Seeds are used in failing lactation.

***Piper brachystachyum* Wall. (Piperaceae)**

In case of cough, paste or juice of the fresh fruit is used as powder or the dried fruit is used as a decoction.

***Phlogacanthus thyrsiflorus* (Hardew.) Mabberlay (Acanthaceae)**

Inflorescence is used in the treatment of cough and worm-infestation. The decoction of the leaves is prescribed in fever.

***Phlogacanthus tubiflorus* Nees. (Acanthaceae)**

Inflorescence is used in the treatment of cough and worm-infestation.

***Phytolacca acinosa* Roxb. (Phytolaccaceae)**

Fresh juice applied on cuts and wounds to stop bleeding and infection.

***Plantago erosa* Wall. (Plantaginaceae)**

Leaves are used in the treatment of dysentery.

***Plantago tibetica* Hook. f. and Thoms (Plantaginaceae)**

Decoction of the plant is useful in the normal medical ailments.

***Plectranthus coleoides* Benth. (Lamiaceae)**

Juice of leaves is taken internally in the treatment of asthma by the Paliyar tribes in Madurai district of Tamil Nadu. Juice of leaves is boiled with coconut oil and applied on head.

***Plectranthus nilghericus* Benth. (Lamiaceae)**

In minor wounds, leaf paste is applied on the wound directly for fastening the healing process.

***Plectranthus rugosus* Wall. (Lamiaceae)**

Leaf extract is mixed with hot water or milk to form bitter syrup, which is administered orally as an antidote in snake bite.

***Pleurospermum stellatum* Benth. (Apiaceae)**

Whole plant is burnt on fire and ash of the plant is mixed with butter and applied on tongue to cure stomatitis.

***Pogostemone benghalensis* (Burm.f.) Ktze. (Lamiaceae)**

Leaf paste is used for healing of deep wounds. It is believed that skin gets normal sooner.

***Polygala abyssinica* R.Br. (Polygalaceae)**

It is used as remedy against rabies.

***Polygala crotalarioides* L. (Polygalaceae)**

It is used as remedy against whitlow.

***Polygala elongata* Klein ex Willd. (Polygalaceae)**

Whole plant is used for the treatment of various ailments. Leaves of *P. elongata* along with *Gymnema sylvestre* leaves and *Andrographis paniculata* leaves are given to the diabetic patients to reduce blood glucose level.

***Polygonum amplexicaule* Don (Polygonaceae)**

Leaves are cooked as vegetable.

***Polygonum affine* D.Don (Polygonaceae)**

Roots of the plant are boiled in water and taken as tea for the cure of rheumatic pains.

***Polygonum glabrum* Willd. (Polygonaceae)**

Leaf extract is used in pneumonia.

***Polygonum hydropiper* L. (Polygonaceae)**

It is used as fish poison.

***Polygonum orientale* L. (Polygonaceae)**

Leaves are used as vegetable by Khasi, Jaintia and Garo tribes of Meghalaya. In Lakhimpur district, Asom, concentrate infusion of *P. orientale* is used to poison fish, juice is given for tubercular swellings and in hyperacidity.

***Polygonum posumba* (Buch.-Ham.) ex D.Don (Polygonaceae)**

Tender shoots and leaves are used in tachycardia. Crushed leaves

juice dissolved in a glass of warm water is used for gastric problems (once or twice a day).

***Polygonum plebejum* R. Br. (Polygonaceae)**

In Lakhimpur district, Asom, crushed leaves are taken in pneumonia; roots are used in bowel complaints.

***Polygonum recumbens* Royle (Polygonaceae)**

It is used as remedy against skin diseases.

***Pothos scandens* L. (Araceae)**

Leaves are used in pain.

***Potentilla eriocarpa* Wall. ex. Lehm (Rosaceae)**

Tea derived from the plant is used in diarrhoea, nephrolithiasis and joint pains.

***Pouzolzia hirta* Hassak (Urticaceae)**

Roots are used as shampoo for hair.

***Pouzolzia zeylenica* (L.) Been. (Urticaceae)**

Whole plant is used in burns, boils, diabetes and urinary diseases.

***Premna barbata* Wall. ex Schauer. (Verbenaceae)**

Plant decoction is given in arthritic pain. Leaves are rubbed on the body in dropsy. Wood used in herpes complex disease.

***Primula denticulata* Sm. (Primulaceae)**

Dried root powder is given orally thrice a day for three months in the treatment of leucorrhoea.

***Primula macrophylla* Sm. (Primulaceae)**

It is used for the treatment of pain.

***Primula nivalis* D. Don (Primulaceae)**

It is used to control the acidity. Its leaves are used after crushing. Tablets of size 5-10 g are prepared and administered orally to the person suffering from acidity and ulcer.

***Prinsepia utilis* Royle (Rosaceae)**

Seed oil is warmed and massaged twice a day in arthritic pain.

The paste of root is applied for healing of cuts, wounds and boils. Seed oil edible, and the plant is used in rituals and religious ceremonies.

***Pseuduvaria prainii* (King) Merr. (Annonaceae)**

Leaves are used in headache and abdominal pain.

***Pterolobium hexapetalum* (Roth.) Sant. & Wagh. (Caesalpiniaceae)**

To reduce delivery time pain, a decoction of the leaves is taken internally.

***Pygmeopremna herbacea* Roxb. (Verbenaceae)**

Warm root paste is applied externally for the treatment of rheumatoid arthritis and gout.

***Pupalia lappacea* (L.) Juss. (Amaranthaceae)**

In case of bone fracture, fresh leaf paste mixed with sesame oil is administered. For rat bite and dog bite, plant paste is applied over the bitten area. Stems used as a toothbrush. In yoke galls, plant paste is applied over the affected area.

***Quercus dilatata* Lindl. (Fagaceae)**

Bark decoction is used in the treatment of dysentery.

***Quercus leucotrichophora* A. Camus (Fagaceae)**

Bark decoction is used in the treatment of tonsillitis.

***Quercus semecarpifolia* Sm (Fagaceae)**

Bark decoction is used in the treatment of dysentery.

***Ranunculus laetus* L. (Ranunculaceae)**

Leaves are consumed as vegetable. Decoction of the plant is used against indigestion.

***Reinwardtia indica* Dum (Linaceae)**

It is known as yellow flax. The flowers are used for the treatment of paralysis. Crushed leaves and stems are applied to wounds infested with maggots. In Kedarnath Wildlife Sanctuary of Garhwal Himalaya, it is used as mouth wash.

***Reinwardtia trigyna* Planch (Linaceae)**

Root decoction is used in the treatment of wounds.

***Rhamnus virgata* Roxb. (Rhamnaceae)**

Decoction is used in treatment of swelling of legs.

***Rheum acuminatum* Hk f (Polygonaceae)**

Young twigs are used in diarrhoea and dysentery.

***Rhizophora apiculata* Bl. (Rhizophoraceae)**

Leaves are used as antidote by Great Andamanese tribe.

***Rhododendron anthopogon* D. Don (Eriaceae)**

Flowers are used in chronic fever, rheumatism, syphilis, sciatic and skin diseases.

***Rhododendron arboretum* Sm. (Eriaceae)**

Used in dysentery, diarrhoea, headache and epistaxis.

***Rhododendron campanulatum* D. Don (Eriaceae)**

Flowers are used in chronic fever, rheumatism, syphilis, sciatic and skin diseases.

***Rhus semialata* Murr. (Anacardiaceae)**

Sour juice of fruits is boiled with water, and concentration is further mixed with water and raw egg to treat diarrhoea and dysentery. It is also used as food preservative.

***Rhynchostylis retusa* Blume (Orchidaceae)**

Whole plant preparations are used to treat asthma, tuberculosis, infantile epilepsy, kidney stone and menstrual disorders.

***Robinia pseudoacacia* L. (Fabaceae)**

The leaves are crushed and made into a paste, which is applied externally.

***Rorippa sylvestris* (L.) Besser (Brassicaceae)**

Poultice of seeds is rubbed on the forehead to cure cold and headache. Poultice derived from the crushed seeds is rubbed externally to get relief instantly.

***Roscoeia procera* Wall. (Zingiberaceae)**

Root powder mixed with black pepper is applied on boils for quick healing. Decoction of root is used in jaundice.

***Roylea cinerea* D. Don (Lamiaceae)**

Infusion of leaves is given in disease of throat and fresh juice of plant given for syphilis.

***Rubus lasiocarpus* Sm. (Rosaceae)**

In pregnancy, leaves decoction is given twice a day.

***Rubus paniculatus* Sm. (Rosaceae)**

In pregnancy, leaves decoction is given twice a day.

***Rhus cotinus* L. (Anacardiaceae)**

Fruits are edible and considered good for gastrointestinal disorders. Leaves are consumed as chutney.

***Rinorea macrophylla* (Decre) O. Ktze. (Violaceae)**

Leaf and bark are used as galactagogue by Great Andamanese tribe.

***Roydsia suaveolens* Roxb. (Capparidaceae)**

Fruits are appetiser and edible. Powder of dried flowers is used in haemorrhoids.

***Roylea cinerea* (D. Don) Baill. (Lamiaceae)**

Juice of the leaves is given in fevers. Shoots are crushed and eaten with salt to strengthen the liver by local villagers. Young shoots are used as insect repellent for cattle during rainy season. Leaves and shoot extraction is used in scabs and other skin infections.

***Rubus ellipticus* Sm (Rosaceae)**

Ripe fruits are edible.

***Rubus mollucannus* L. (Rosaceae)**

Fruits are edible and stimulant.

***Rumex nepalensis* Spr. (Polygonaceae)**

Fresh leaves are cooked as vegetable.

***Rumex obtusifolius* L. (Polygonaceae)**

Fresh stem and leaves are eaten as vegetable. Leaves are crushed against the surface affected by stings of common nettle (*Urtica dioica*).

***Rumex hastatus* D. Don (Polygonaceae)**

The aerial parts are refreshing and eaten raw and given as fodder to cattle.

***Rungia stolonifera* Clarke (Acanthaceae)**

Whole plant is used for tooth and gum diseases.

***Rhynchosia minima* (L.) DC (Fabaceae)**

Whole plant is used for bath after delivery for body care.

***Saccolabium papillosum* Lindl. (Orchidaceae)**

Root is used in rheumatism.

***Saccolabium praemorsum* Lindl. (Orchidaceae)**

Root is used in rheumatism.

***Salix elegans* Wall (Saliaceae)**

Fruit decoction is given in the treatment of rickets.

***Salix wallichiana* Andrs. (Salicaceae)**

Decoction of leaves is used to wash the feet and lower portion of legs to cure fever and general body pain.

***Salvia aegyptiaca* L. (Lamiaceae)**

The plant is given in diarrhoea.

***Salvia coccinea* L. (Lamiaceae)**

Flowers are consumed for nectar.

***Salvia lanata* Roxb. (Lamiaceae)**

Whole plant is used in the treatment of vomiting.

***Sambucus wightiana* Wall. ex Wt. & Arn. (Sambucaceae)**

Fruits are used to initiate vomiting to treat stomach disorders, to wash stomach to expel poisonous substances.

***Sapium insigne* Trimen (Euphorbiaceae)**

It is sued as remedy in alopecia.

***Sarochalymys pulcherrima* Gaud. (Urticaceae)**

Tender leaves are used along with pork to prevent tapeworm infestation.

***Sarcococca saligna* Müll. Arg. [Buxaceae]**

Leaves are ground and the paste applied on burns as a coolant for quick relief.

***Sarcostemma acidum* (Roxb.) Voigt (Asclepiadaceae)**

During earache, tender tip juice is used as an ear drop; during burning micturition, plant powder is taken with two cups of toddy; during snake bite, mixture of root crushed with *neem* stem bark is given orally.

***Sarcostemma intermedium* Decne. (Asclepiadaceae)**

5-6 drops of latex are applied externally on the spot of an insect bite.

***Sarcostemma scamone* (L.) Bennet (Asclepiadaceae)**

Leaves are fed to goat for increasing milk quantity.

***Satyrium nepalense* D. Don (Orchidaceae)**

Root decoction is used as a tonic and to treat malaria and dysentery.

***Saussurea glanduligera* Sch. - Bip. ex Hook.f. (Asteraceae)**

Fresh juice of leaves and flowers along with other ingredients is taken as an antidote against food poisoning. The dried powder is also consumed as cooling agent.

***Saussurea simposniana* (Field and Garden) Lipschiltz Edgew (Asteraceae)**

Whole plant is burnt and smoke is driven in the house where animals live. The animals which are believed to stop milking due to influence of evil spirits, start milking again.

***Scaevola sericea* Vahl. (Goodeniaceae)**

Fruits and leaves are used in rheumatic pain, fever and bodyache.

***Schefflera venulosa* (Wight and Arn.) Harms. (Araliaceae)**

Boiled root mixed with rice and consumed in dropsy.

***Schima wallichii* Choisy (Theaceae)**

Fleshy part of fruit is stirred along with little water to form foam and applied as poultice in fever.

***Scorzonera divaricata* Turcz. (Asteraceae)**

Decoction of leaves and shoots is prepared at low temperature and taken orally to cure jaundice and dysentery.

***Scutellaria angulosa* Benth (Lamiaceae)**

Decoction of whole plant is used in the treatment of hyperacidity.

***Scutellaria repens* Ham. (Lamiaceae)**

2-3 g powdered dried plant given with lukewarm water to check bleeding of the nose.

***Sedum heterodontum* Hook. f. and Thomson (Crassulaceae)**

Stem boiled in sugary water, which is taken to relieve indigestion and constipation.

***Sedum glaucophyllum* Clausen (Crassulaceae)**

Paste of whole plant applied to cure blisters.

***Sedum tibeticum* Hook.f. (Crassulaceae)**

Sap of fresh plant parts along with other ingredients cures heart and lung troubles.

***Sedum wallichianum* Hook. (Crassulaceae)**

Stem bark is used to clean teeth to avoid the infection.

***Senecio chrysanthemoides* DC. (Asteraceae)**

Decoction is used in the treatment of skin diseases.

***Senecio rufinervis* DC. (Asteraceae)**

Decoction of seeds used in the treatment of wounds.

***Senecio hewrensis* (Dalz.) Hook. F. (Asteraceae)**

Roots soaked in water overnight are used to reduce body heat.

***Setaria viridis* L. (Poaceae)**

Roasted grains used as a substitute of coffee. Powdered grains mixed with wheat flour for making dough for *chapatti*.

***Shuteria vestita* W and A (Fabaceae)**

In boils appearing on the skin, leaves paste is used directly as an external ointment.

***Sida acuta* Burm.f. (Malvaceae)**

For treating body tumours, leaves crushed with turmeric and common salt is used externally. In case of vomiting of mother-fed, root extract is given with milk daily once for three days, whereas in case of vomiting due to stomachache and uneasiness, root decoction is taken orally.

***Sida cordata* (Burm.f.) Borssum (Malvaceae)**

During boils and cuts, leaves crushed with those of *Annona squamosa* are applied externally.

***Skimmia arborescens* T. Anders. ex Gamble (Rutaceae)**

Fresh leaves are crushed to produce an extract, which is taken along with milk to get relief from urinary infections. The smoke of the dried leaves is also used as insect repellent.

***Smilax aspericaulis* Wall. (Smilacaceae)**

Stem is used for brushing teeth which is effective against pyorrhoea and gingivitis.

***Smilax perfoliata* Lour. (Smilacaceae)**

Tender leaves are used as vegetables. The root paste is used for healing of wounds.

***Smilax zeylanica* L. (Liliaceae)**

Root paste is applied in joint pain.

***Smithia hirsuta* Dalz. (Fabaceae)**

Cuts are fed with roasted leaves in *chapati* for treatment of the wounds.

***Solanum americanum* Miller (Solanaceae)**

During body swellings, leaf juice is smeared as a lotion. To induce fertility in women, leaf extract is administered daily once for three days after menstrual period.

***Solanum anguivi* Lam. (Solanaceae)**

Crushed juice mixed with honey is orally taken in sore mouth and tongue disorder.

***Solanum denticulatum* Blume (Solanaceae)**

The Kani, Karuman and Kurumbha tribes of Kerala use this plant

as food, the whole plant part paste is applied in cloth and tied on the head in the treatment of migraine.

***Solanum ferox* L. (Solanaceae)**

Decoction of root is administered orally in fever.

***Solanum etiopicum* L. (Solanaceae)**

Monpa ethnic group in Arunachal Pradesh, use this plant in the treatment of tapeworm and roundworm infestation.

***Solanum khasianum* C.B. Clarke (Solanaceae)**

Fruit fumes are inhaled in asthma and dental pain.

***Solanum torvum* Sw. (Solanaceae)**

Crushed juice mixed with honey is orally taken in tonsillitis.

***Solanum virginianum* L. (Solanaceae)**

Dried plant powder is smoked to cure toothache. The dried plant powder is mixed with turmeric and is taken orally to cure cough.

***Solanum viarum* Dun. (Solanaceae)**

Roots are used for piles.

***Solena amplexicaulis* (Lamk.) Gandhi (Cucurbitaceae)**

A decoction of rhizomes is used to treat diarrhoea.

***Solidago virgaurea* L. (Asteraceae)**

Decoction of the whole herb is used for the treatment of asthma, rheumatism and applied on wounds. Root chewed in throat irritation.

***Sonchus asper* L. (Asteraceae)**

Whole plant is ground and powder is applied on burns.

***Sonchus oleraceus* L. (Asteraceae)**

Leaves are ground with the equal amount of leaves of *Smilax zeylanica* and applied externally on the cuts once a day till cure.

***Sonchus wighatianus* DC (Asteraceae)**

Latex is used to stop bleeding and young leaf juice is used for gastritis and conjunctivitis.

***Solena amplexicaulis* (Lam.) Gandhi (Cucurbitaceae)**

Extract of root is used approximately a tablespoonful thrice a day for a long time for treatment of haematuria in livestock. Root and seeds are used for digestive disorders. Ripe fruits edible leaves and tender shoots are used as fodder.

***Spermadictyon suaveolens* Roxb. (Rubiaceae)**

Root paste is applied externally to relieve joint pain.

***Stachytarpheta indica* Vahl (Verbenaceae)**

Leaf extract is used externally for cuts and ulcers.

***Stellaria media* (L.) Vill (Caryophyllaceae)**

Plant consumed as a vegetable.

***Stephania rotunda* Lour. (Menispermaceae)**

Stems, leaves, and tubers have been used in the Cambodian, Lao, Indian and Vietnamese folk medicine systems for years to treat a wide range of ailments, including asthma, headache, fever, and diarrhoea.

***Sterculia villosa* Roxb. (Sterculiaceae)**

Stem-bark is used as fibre.

***Streptolirion volubile* Edgew. (Commelinaceae)**

Crushed leaves are applied on wounds.

***Styrex serulatum* Roxb. (Styeaceae)**

Tender shoots are antibacterial.

***Symplocos theifolia* D. Don (Symplocaceae)**

Bark is used in skin diseases.

***Syngonium podophyllum* Schott (Araceae)**

Leaves are effective against cancer and cure mouth and feet diseases.

***Syzygium samarengense* (Bl.) Merr. & Perry (Myrtaceae)**

Leaves are used in fever and headache.

***Swertia purpurascens* Wall. (Gentianeae)**

Decoction of whole plant is used in fever.

***Tamarix aphylla* (L.) H. Karst. (Tamaricaceae)**

Leaves are used in the treatment of skin worms and internal worms of nose and ear, and toothache.

***Tanacetum falconeri* Hook.f. (Asteraceae)**

Whole plant is dried under shade and powdered. The powder is taken along with other ingredients to cure joint pains. It is also prescribed for purifying blood.

***Tanacetum longifolium* Wall. (Asteraceae)**

Expressed juice is used in intestinal gas and colic and fever.

Tanacetum nubigenum* Wall. ex. DC. (Asteraceae)**Tecoma stans* (L.) H. B. & K (Bignoniaceae)**

Root, leaves and seeds are used as diuretic, vermifuge, tonic and hypoglycaemic.

***Tephrosia lupinifolia* DC (Fabaceae)**

It is used in the treatment of stomachache, diarrhoea, rheumatism, asthma and urinary disorders.

***Terminalia citrina* (Gaertn.) Roxb. ex Fleming (Combretaceae)**

It is commonly used as preventive medicine by Mishing community of North East India.

***Thelepaepale ixicocephala* (Bth.) Bremek. (Acanthaceae)**

Mature wood is used in thatching of roof and house walls.

***Thermopsis inflata* Camb. (Fabaceae)**

Seed powder is consumed to cure joint pains. Also taken orally with milk or water as a general tonic to improve the health.

***Thottea tomentosa* (Bl.) Ding Hou. (Aristolochiaceae)**

Whole plant is used in chest pain, headache, cough, and cold.

***Thunbergia alata* Sims (Acanthaceae)**

Leaf poultice is mixed with the bee-hive mud and applied over forehead in acute headache.

***Thunbergia grandiflora* Sambal (Acanthaceae)**

Leaf decoction is orally taken in stomach diseases.

***Thymus linearis* Benth. (Lamiaceae)**

Expressed juice of the plant is used in fever, cough, cold and stomach complaint. Plant decoction is used as herbal tea as a preventive measure for indigestion.

***Thysanolaena maxima* (Roxb.) Kuntze (Poaceae)**

Root paste is applied on boils to dry the pus and quick healing.

***Typha latifolia* L. (Typhaceae)**

It is used in the treatment of kidney stones and painful menstruation.

***Typhonium trilobatum* Schott. (Araceae)**

Tuber is crushed and taken in case of snake bite.

***Thysanolaena latifolia* (Roxb.ex Hornem) (Poaceae)**

Paste prepared from the root stock is applied externally on boils.

***Thysanolaena maxima* (Roxb.) Kuntze (Poaceae)**

Roots, dried or fresh, paste applied to cheek boils.

***Tithonia diversifolia* A. Gray (Asteraceae)**

Inflorescence pounded and spread over the affected area in wounds and bruises.

***Tolypanthus langifer* (Wight) van Teigh (Loranthaceae)**

Plant extract is employed in the treatment of leucorrhoea.

***Toona hexandra* Wall ex. Roxb. (Meliaceae)**

Leaves are tonic, useful in chronic dysentery. Flowers are used in menstrual disorders.

***Trichosanthes tricuspidata* Lour. (Cucurbitaceae)**

Fruit pulp is used in psoriasis.

***Trillidium govanianum* (Wall. ex D. Don) Kunth (Trilliaceae)**

Rhizome chewed for digestive disorders and also for dysentery.

***Tropidia curculigoides* Lindl. (Euphorbiaceae)**

Root decoction cures diarrhoea and whole plant decoction is used in malarial fever.

***Tubiflora acaulis* (L.F.) Kuntze (Acanthaceae)**

Leaf powder with water is used in urinary problems.

***Tupistra aurantiaca* Wall. (Liliaceae)**

Small pieces of root stock are used orally in case of food poisoning.

***Tupistra nutans* Wall. (Liliaceae)**

Inflorescence is powdered and mixed with water and taken to relieve body pain.

***Uncaria sessilifructus* Roxb. (Rubiaceae)**

Stem-bark is used as masticatory.

***Urtica ardens* L. (Urticaceae)**

Whole plant is used in exorcism.

***Urtica parviflora* L. (Urticaceae)**

Flogging by leaf is done in bone fractures. Root is chewed to cure throat pain. Leaves are cooked as a vegetable and taken against high blood pressure.

***Vanda coerulea* Griff.ex Lindl. (Orchidaceae)**

Flower juice is used as eye drops against glaucoma, cataract and blindness. Leaf is used externally in skin diseases and leaf juice is used in diarrhoea and dysentery.

***Vanda cristata* Wall. ex Lindl. (Orchidaceae)**

Leaf acts as expectorant.

***Vanda parviflora* Lindl. (Orchidaceae)**

Crushed leaf is applied on cuts and wounds, boiled leaves are used in earache. Leaf and roots are used in rheumatism.

***Vanda spathulata* (L.) Spreng. (Orchidaceae)**

Powdered flowers are used in the treatment of constipation, asthma and mania.

***Vanda teres* Lindl. (Orchidaceae)**

Leaf is used in typhoid and employed as an anti-infertility drug.

***Vanda tessellata* (Roxb.) Hook. Ex Don. (Orchidaceae)**

Paste of leaves is used in fever. Expressed juice of the leaves is used in the treatment of otitis media. Its root is used as antidote against scorpion sting and remedy for bronchitis.

***Vanda testaceae* Rchb.f. (Orchidaceae)**

Leaves are used for malarial fever, nervous system disorders and nervous debility. Its leaves and decoction made of root are used to treat asthma and earache.

***Vanilla planifolia* Andrews (Orchidaceae)**

Sheath infusion is used to treat fever, hysteria and impotence. Fruit acts as aphrodisiac.

***Vangueria spinosa* Roxb. (Rubiaceae)**

Fruits are used for as anti-fertility agents.

***Vernonia cinerascens* Sch. Bip (Asteraceae)**

Leaves and rhizomes are used in gastritis, urinary infections, male-sterility, navel-aches and constipation.

***Veronica persica* Poiret (Scrophulariaceae)**

In case of dermatitis, the plant is crushed into powder and mixed with mustard oil to make a paste. The paste is applied on affected portion twice a day.

***Viburnum foetidum* Wallich. (Caprifoliaceae)**

A handful of fresh leaves is boiled with a little water and the concentrated mixture/decoction or a few fresh leaves are crushed and the squeeze juice is used as an ear drop.

***Viburnum grandiflorum* Wall. ex DC. (Caprifoliaceae)**

Seed juice is used to treat typhoid and whooping cough. The poultice made from the dried parts of the plant is rubbed on the skin to heal fractures.

***Vicia hirsuta* (L.) Koch (Fabaceae)**

Aerial parts are cooked as a vegetable. Seeds also consumed.

***Viola betonicifolia* Smith (Violaceae)**

Decoction of leaves is used in cough.

***Viola biflora* L. (Violaceae)**

Decoction of leaves is used in cough.

***Viola canescens* Wall. (Violaceae)**

Decoction of leaves is used in cough.

***Viola patrinii* Ging. (Violaceae)**

Decoction of whole plant is used orally in cough and cold.

***Viola serpens* Wall (Violaceae)**

A decoction is used in cough and cold.

***Viscum album* L. (Loranthaceae)**

Decoction made from whole plant is used in enlarged spleen. The plant is used as nutritious fodder for cattle in Kinnaur area and given particularly to calves and goat kids.

***Viscum articulatum* Burm.f. (Loranthaceae)**

2 g of plant ground in water if given 3-4 days during menstruation period, causes permanent sterility. Decoction of whole plant also has similar effect. Whole plant is ground in water and given 1-3 g with jaggery twice a day in epistaxis and twice daily for 2-4 days in haemorrhoids. Paste prepared from the entire dried plant is applied to heal fractured bones, and dislocation.

***Viscum orientale* Willd. (Loranthaceae)**

Fruits of *V. orientale* and equal quantities of host plant are ground together and small pills are made. One pill is used daily in the morning for 4-5 days in case of giddiness and also stiffness.

***Vitex peduncularis* Wall (Verbenaceae)**

Fresh leaf extract is used in case of snake bite.

***Waltheria indica* L. (Sterculiaceae)**

Plant powder is applied externally for drying and healing of wounds and ulcers.

***Wedelia biflora* DC. (Asteraceae)**

Leaf paste is applied on cuts and headache.

***Wendlandia tinctoria* DC. (Rubiaceae)**

Inflorescence is used freshly in gastro-enteritis.

***Willoughbea utilis* Roxb. (Apocynaceae)**

Fruits are edible.

***Xeromphis spinosa* (Rubiaceae)**

Paste of the fruits along with salt is applied on boils.

***Ximenia americana* L. (Olacaceae)**

During diabetes, stem-bark extract is administered. In maggot-infested sores, seed paste is applied externally. During body pain, stem bark paste is administered with a pinch of pepper powder. In case of tapeworms in children, paste of tender tips is taken daily once for a week and in case of gastric trouble, the tender tips paste is administered with one cup of milk. Ripe fruits are eaten by local people.

***Xylosma longifolia* Clos. (Flacourtiaceae)**

Fresh leaf is boiled till it is reduced to 1/3 of the initial volume and used for bath in scabies.

***Zanthoxylum acanthopodium* DC. (Rutaceae)**

Leaves are used in the treatment of leucoderma and abdominal diseases in Bhutan. Bark is employed to clean teeth in India. Fruit is used in food poisoning.

***Zanthoxylum nitidum* (Roxb.) DC (Rutaceae)**

Fruit is given in ringworm and flatulence.

***Zanthoxylum rhetsa* (Roxb.) DC. (Rutaceae)**

Leaf decoction is taken orally in jaundice.

***Zehneria scabra* (L.) Sonder (Cucurbitaceae)**

Decoction is taken orally in jaundice

***Zehneria umbellata* Thw. (Cucurbitaceae)**

Ripe red fruits are often eaten by the cowherds.

***Zingiber montanum* (Koen.) Link ex. (Zingiberaceae)**

Rhizome of this plant is boiled in castor oil and used for massage till cure for arthritis.

***Zingiber nissanum* Raman. (Zingiberaceae)**

Paste of fresh tubers is applied for wound-healing.

***Zingiber zerumbet* (L.) Smith (Zingiberaceae)**

Root tuber is ground into a paste and administered orally along with water thrice a day to cure dysentery caused by witchcraft.

***Zizyphus rugosa* Lam. (Rhamnaceae)**

Stem bark decoction is administered for dysentery in doses of 5 spoonful thrice a day for three days.

Ethnobotany of Medicinal Plants used in Ayurveda***Ahiphena* (*Papaver somniferum* L., Papaveraceae)**

Nerve disorders: *P. somniferum* is very effective in treating nerve disorders in the body. When taken over time, the medicine increases the strength of the body nerves.

Diarrhoea: *P. somniferum* seeds are very effective in treating diarrhoea. The seeds are powdered and mixed with milk and consumed. They also cure the stomach pain caused due to excessive heat and dehydration. Opium is rich in fiber which helps in absorbing the water and thereby easing digestion. The seeds can be roasted and powdered and mixed with honey and consumed.

Insomnia: *P. somniferum* is very effective in treating insomnia. They work on the nerves and bring peaceful sleep. You can consume a spoon of poppy seed oil before going to sleep. Effective coolant opium is an effective coolant for the body. They are ground and consumed. They reduce the body heat and keep the body cool.

Good cholesterol levels: *P. somniferum* increases the HDL or good cholesterol levels in the body. It increases the blood lipid profile thereby prevents strokes and artery diseases. It helps keep the cholesterol under control and reduces the blood pressure in the body.

Renal calculus: *P. somniferum* seeds have the property to reduce calcium absorption. Hence they have the property to reduce the formation of kidney stones.

Muscle and nerve pain: *P. somniferum* seeds are used as painkiller and muscle relaxant. They have been used to relieve toothaches and cure spasms.

***Agnimanth* (*Premna integrifolia* L., Verbenaceae)**

Reduces inflammation and fever, amapachana, and cures oedema, diseases of the urinary tract, diabetes, dyspepsia, flatulent colic, hemorrhoids, constipation, fever, catarrh, cough, bronchitis, asthma, skin diseases, anemia, neuralgia, insufficient lactation, inflammatory joint disease, tumours, and constituent of the *Chyavanaprasha* formulation. Leaves eaten to increase breast milk production

***Agaru* (*Aquilaria agallocha* Roxb., Thymelaeaceae)**

Astringent, carminative, antiasthmatic, anti-diarrhoeal, antidysenteric; used in gout, rheumatism and paralysis; as a stimulant in sexual debility; as a liniment in skin diseases.

***Amalaki* (*Phyllanthus emblica* L., Euphorbiaceae)**

Constipation: Fruit is occasionally pickled or preserved in sugar. When dry it is said to be gently laxative, according to some sources the fresh fruit is also laxative. Fresh ripe fruits are used extensively in India as a laxative, one or two fruits being sufficient for a dose.

Loss of appetite: Green fruits are made into pickles and preserves to stimulate the appetite.

Epistaxis: Seeds are fried in *ghee* and ground in conjee (the liquid from boiled rice) is applied to the forehead to stop bleeding from the nose.

Fever: Flowers are employed by the Ayurvedic doctors for their supposed refrigerant and aperient qualities. A decoction of the emblic seed, chitrak root (*Plumbago zeylanica* or *Leadwort*), chebulic myrobalan and pipili (*Piper longum*) is used in fevers and there is also a compound powder composed of equal parts of the emblic seed (*Emblica officinalis*), chitrak root, chebulic myrobalan, pipili and saindhava (rock salt) which may also be used.

Furunculosis: Pericarp of the fruit is often used in decoctions along with other ingredients and also applied externally on boils with cow *ghee* to promote suppuration.

Dental problems: The roots of *E. officinalis* (10 g) are ground and taken twice daily for one day only after taking food. Alternatively, the leaves of *E. officinalis* are squeezed and the juice extracted. This juice is put in the ear to get relief from toothache.

Diabetes mellitus: Fruits and infusion of the seeds are used in the treatment of diabetes. Decoctions of the leaves and seeds are used in the treatment of diabetes mellitus.

Diarrhoea: It is used medicinally for the treatment of diarrhoea. As a fruit decoction it is mixed with sour milk and given by the natives in case of dysentery. A decoction and evaporation of the root solution produce an astringent extract equal to catechu. An infusion of the leaves with fenugreek seed is given for chronic diarrhoea.

Dyspepsia: Tender shoots given in buttermilk cure indigestion and it is known that green fresh leaves combined with curd have similar effect.

Headache: A paste of the fruit is a useful application to the forehead in cases of headache.

Oral ulcers: Decoction of the leaves is also useful as a mouth wash in the treatment of aphthae.

Pruritis: Seeds are burnt, powdered and mixed in oil as a useful application for scabies or itch.

Vaginitis: A mixture of the fruit juice and sugar is used for the relief of burning in the vagina.

Apamarg (Achyranthes aspera L., Amaranthaceae)

Chlorea: Root of apamarg is taken with water in chlorea.

Sidhma (type of leucoderma): In sidhma, seed of mulaka and fresh juice of apamarg is made to paste and applied externally.

Insomnia: Decoction of kakjangha, apamarg, kokilaksa and suparnika is useful in insomnia.

Snake poison: Roots of apamarg and piper nigrum is used in snake poison.

Urinary tract infection: Decoction of apamarg, yastimadhu, gokshur and patha is used for urinary tract infection.

Chronic bonchitis: Apamarg kshar is used in chronic bonchitis with pippali, ativisha, kupilu, grith and madhu.

Hemorrhoids: Apamarg root is made paste with tanduloodak and used with honey in hemorrhoids. The paste of seed of apamarg is used externally for raktrash.

Renal calculus: In renal calculus, apamarg kshar is used with sheep milk.

Odontalgia: Juice of apamarg is painted on gums in toothache.

Aragvadha (*Cassia fistula* L., Fabaceae)

Ayurveda recognizes the seed as antibilious, aperitif carminative and laxative, the root for adenopathy, burning sensations, leprosy, skin diseases, syphilis and tubercular glands, the leaves for erysipelas, malaria, rheumatism and ulcers, the buds for biliousness constipation, fever, leprosy and skin disease, and the fruit for abdominal pain, constipation, fever, heart disease and leprosy.

Furunculosis: Boil 100 g leaves of *Cassia fistula* in 3 litres of water till 250 ml of decoction remains. Apply the decoction once a day after taking bath. Continue until the boils are cured.

Blood dysentery: Grind together the root of *Cassia fistula* and the root of *Holarrhena antidysenterica* and extract the juice from ground root. Filter it. Take 4 teaspoonsful of this juice once a day for two days.

Burning sensation during urination: Grind the leaves of *Cassia fistula* to make paste. Apply the paste on the naval before going to bed at night only once.

Cough: Grind together one fruit each of *Terminalia chebula*, *Terminalia bellerica* and *Emblica officinalis* with 10 g dried ginger, 1 piece of *Piper longum* and 10 leaves of *Cassia fistula* to make paste. Prepare 30 pills out of this paste. Take one pill as a dose thrice a day for 10 days.

Constipation: Grind the seeds of the *Cassia fistula* to make paste. Take 5 g of the paste orally with warm water only once. Then take stale rice water to check motion.

Eczema: Grind the tender leaves of *Cassia fistula* with stale rice water to make paste. Before applying the paste, wash the affected area properly.

Ringworm: Grind the tender leaves of *Cassia fistula* to make a paste. Before applying the paste on the ringworm, rub the affected area to get good result. Then apply the paste on the ringworm as an ointment.

Pain in ribs: Grind 20 g root of *Cassia fistula* with 21 black pepper to make paste. Make three pills out of the paste. Take one pill in the morning once a day for three days.

Rheumatism: Grind the leaves of *Cassia fistula* to make paste and smear the paste on joints. Smear twice a day for 2 to 3 days.

Skin diseases: Grind the leaves of *Cassia fistula* to extract juice. Apply the juice on the affected skin after properly washing the affected area. Continue treatment till it cures.

Snake bite: Chew and eat the root of *Cassia fistula* soon after snake bite.

Spleen disease: Grind two fruits (without exocarp) of *Cassia fistula* to make paste. Then smear the paste on the belly twice a day for two days.

Tonsilitis: Extract the septum of the fruit of *Cassia fistula* and smear it on the lower side of cheek to cure from the swelling of root of ear due to cold.

Typhoid: Grind together the seeds of *Cassia fistula*, root of *Mimosa pudica*, root of shyamnai, root of gada and root of *Rauvolfia serpentina* to make paste. Take 10 g as a dose thrice a day for 7 days.

Infantile helminthiasis: Grind the sun-dried fruit of *Cassia fistula* to make powder. Give one teaspoonful of the powder to expel intestinal worms. One dose a day for three days.

***Ardra*-*Sunthi* (*Zingiber officinale* Rosc., Zingiberaceae)**

Digestive disorders: This extremely useful herb is used to treat patients suffering from dyspepsia, flatulence, vomiting, spasms, colic and other stomach problems. Chewing a piece of ginger regularly can help in treating problems of excessive secretion of saliva, volatile oil and diastase enzyme. Half a teaspoon of ginger juice mixed with fresh lime juice and honey can be helpful to cure nausea, vomiting as well as problems of indigestion.

Cough and cold: The herb is used to cure cough. Juice of ginger mixed with honey taken 3 to 4 times a day is beneficial for this purpose. Ginger tea is prescribed to be used for treating fever associated with cold.

Respiratory disorder: Fresh ginger juice with a cup of fenugreek and honey makes a good diaphoretic mixture to treat sweating and reducing fever in patients suffering from influenza. It is known to act as an expectorant in curing asthma, cough and tuberculosis.

Impotency: The herb is known to be an effective aphrodisiac. Half a teaspoons of its juice with honey and boiled egg taken for a month can tone up the sex organs. It treats impotency, premature ejaculation, involuntary seminal discharge and also spermatorrhoea.

Menstrual disorders: A piece of ginger with a cup of boiled water must be used to cure menstrual problems. This decoction is consumed for treating painful irregular menstruation.

Ache and pain: Ointment made of ginger can help in relieving head pains. It is applied to the temples to relieve headache.

***Arjuna* (*Terminalia arjuna* W. and A., Combretaceae)**

In Ayurveda, *T. arjuna* is regarded as an important cardio tonic herb. The bark of *T. arjuna* has been used in India for more than 3000 years, primarily as a heart remedy. An Indian physician named Vagbhata has been credited as the first to use this product for heart conditions in the seventh century AD. It has also been used for asthma,

angina, coronary artery disease, heart failure and edema, bile duct disorders, scorpion stings, poisonings, wounds, hemorrhages and ulcers, applied topically as a powder. It is traditionally prepared as a milk decoction. Herbal tea made of *Arjuna* bark is very common and convenient form to use for its benefits as medicine.

Arka (Calotropis procera (Ait.) Ait. f., Asclepiadaceae)

Snake poisoning: If bitten by poisonous snakes, few leaves of the plant are plucked and chewed. Alternatively, the roots of the plant are crushed and the juice is applied over the bitten area. Juice is extracted from *C. procera* leaves and mixed with equal quantity of honey. When consumed, it cures fever. The body temperature comes down immediately.

Worm-infestation: Juice is extracted from the leaves and mixed with honey and consumed. The worms in the intestines get killed.

Stomach ulcers: The leaves of *C. gigantea* are dried and powdered. They can be applied externally over the stomach to heal ulcers.

Rheumatism: The plants of *C. procera* have latex in them. This latex can be taken and applied over the infected area, be it swellings or rat bitten areas or other disorder infected area. The latex can also be applied over the dental area for any tooth related problems.

Constipation: *C. procera* cleans the unwanted waste contained in the stomach and makes the stomach clean. It is very effective in curing dysentery.

Nerve diseases: Latex from the plant is taken and applied over the body to cure nerve disorders.

Bronchial asthma: Flowers of the herb erukku or white madar have high medicinal value in treating asthma.

Abortion: *C. procera* has been used for inducing abortions in India. The leaves of the plant were inserted into the cervix so that it causes labor pains and induces abortion.

Skin disorders: The oil extracted from *C. procera* is used to treat skin problems like eczema, ringworm, etc. It also cures the bites caused due to insects or scorpions.

Asvagandha (Withania somnifera Dunal., Solanaceae)

Centuries of Ayurvedic usage of *W. somnifera* has revealed it to have pharmacological value as an adaptogen, antibiotic, abortifacient, aphrosidiac, astringent, anti-inflammatory, deobstruent, diuretic, narcotic, sedative, and tonic.

W. somnifera is one of the major herbal components of geriatric tonics mentioned in Indian systems of medicine. In Ayurvedic medicine,

W. somnifera is described as "Indian ginseng". The plant is claimed to have potent aphrodisiac rejuvenative and life prolonging properties. It has general animating and regenerative qualities and is used among others for the treatment of nervous exhaustion, memory related conditions, insomnia, tiredness potency issues, skin problems and coughing. It improves learning ability and memory capacity.

The traditional use of *W. somnifera* is to increase energy, youthful vigour, endurance, strength, health, nurture the time elements of the body, increase vital fluids, muscle fat, blood, lymph, semen and cell production. It helps counteract chronic fatigue, weakness, dehydration, bone weakness, loose teeth, thirst, impotency, premature aging emaciation, debility, convalescence and muscle tension. *W. somnifera* is applied to the skin for treating wounds, backache, and one-sided paralysis (hemiplegia).

Asvagola (Plantago ovata Forssk., Plantaginaceae)

Psyllium seeds contain an abundance of mucilage, a substance that absorbs water and becomes gel-like in the intestine. The mucilage swells when exposed to water in the intestines and this extra volume helps transport waste through the intestinal tract. In addition, the moist, gummy mucilage lubricates the lining of the intestine.

Hyperlipidemia: It helps to reduce the risk of heart attack by decreasing serum cholesterol through proper excretion of bile acids.

Respiratory system: It is also used as an expectorant.

Haemorrhoids: In a placebo controlled trial in 50 patients with bleeding internal haemorrhoids *P. ovata* was found to be helpful in alleviating symptoms.

Constipation: Isabgol seeds are used in catarrh, chronic dysentery, intestinal fluxes, irritable bowel syndrome or spastic colon and diarrhoea.

Urinary tract infection: It is used in infections of bladder, urethra and kidney.

Ashoka (Saraca asoca (Roxb.) Wilde, Caesalpinaceae)

Anti-bacterial: *S. asoca* is used in fever, cold and infections as it possesses anti-bacterial properties.

Menorrhagia: Ayurveda has been using ashoka for menorrhagia traditionally. A preparation made from ashoka tree known as ashokarishta is given for this disease and also for uterine infections. It helps stop vaginal bleeding.

Haemorrhoids: Ashoka bark has been traditionally used as a remedy for internal haemorrhoids.

Dysmenorrhoea: It is also recommended against dysmenorrhoea. It is useful in leucorrhoea.

Ativisa (Aconitum heterophyllum Wall., Ranunculaceae)

External uses: Crushed leaves, mixed with saindhav are applied locally. Seeds crushed in honey are applied locally on throat, in tonsillitis. Nasal insufflations of roots is beneficial in migraine.

Internal uses

Cervical lymphadenitis: Juice of roots along with milk is an expectorant. Root powder is used orally in cervical lymphadenitis.

Ascites: Seed and root are used in ascites. Seeds are laxative.

Urinary system: Seeds are diuretic, root decoction reduces burning of urinary tract. It increases volume of urine.

Spermatorrhoea: Root is used in spermatorrhoea. Decoction of roots is also used in burning of vagina.

Infantile diseases: Ativisa alone or along with karkaangi and pippali in case of cough and fever.

Diarrhoea: Ativisa + bhanga + vaca as powder in febrile diarrhoea: sunthi, kutaja, musta, guduçi and ativisa are given orally in the form of decoction.

Malabsorption: Decoction made of ativia, sunthi and musta is administered orally.

Dysuria: Ativisa, amla dravyas, sunthi, goksura, kantakari are made as peya (gruel) and given along with phanita (jaggery syrup).

Acute poisoning: A *ghee* prepared with ativisa and cow's milk is used orally or as nasal drops in case of acute poisoning. The *ghee* may also be processed with sveta and madayantika.

Rodent poisoning: Ativisa root is made into paste by grinding with honey and administered orally.

Ulcer: Syonaka, prativisa, kantakari mûla are made into paste and applied over the wounds.

Abdominal diseases: 1 part ativisa + 3 parts añkola, administered orally with rice water (Tandulodaka).

Bakuci (Psoralea corylifolia L., Fabaceae)

Abdominal diseases: *P. corylifolia* is used in diarrhoea, borborygmi, and abdominal pain.

Integument: *P. corylifolia* is used in alopecia, psoriasis, eczema, and vitiligo-externally and internally.

Genito-urinary system: *P. corylifolia* is used in frequent urination and incontinence.

Leucoderma (vitiligo): The essential oil varies enormously in its effects on different persons. With the majority (95%) it causes only redness of the leucodermic patches, but in rest 5% cases there is extreme sensitivity to the oil, so much so that the blistering may be produced. The oil being an essential oil permeates through the epidermis to the prickle cells of the lymphatic and so it finds the way to sub capillaries and stimulates the cells situated there.

Bala (Sida cordifolia L., Malvaceae)

Arthritis, rheumatism and wounds: *S. cordifolia* oil is used topically to the sore muscles and sore joints in rheumatism and arthritis. The crushed leaves can be used as a cataplasm to alleviate local pains and because of its astringent value for the cure of external wounds of the skin.

Diarrhoea: *S. cordifolia* cures diarrhoea and is invigorating and nutritive.

Elephantiasis: Made into paste with juice of palmyra tree, it is applied locally in elephantiasis.

Facial paralysis and sciatica: Oil prepared from the decoction of root bark of *S. cordifolia* mixed with milk and sesame oil, finds application in diseases of the nervous system, and is efficacious in curing facial paralysis (Bell's palsy) and sciatica.

Fever: Decoction of the root of *S. cordifolia* and *Zingiber officinale* is given in intermittent fever attended with chills and rigor.

Internal hemorrhoids: Leaves are cooked and eaten in cases of bleeding piles.

Spermatorrhoea, rheumatism, and gonorrhoea: Juice of the whole plant, pounded with a little water is used in doses of ¼ seer for spermatorrhoea, rheumatism, and gonorrhoea.

Urinary diseases: *S. cordifolia* has diuretic effect and is useful in urinary problems, including cystitis.

Bharangi (Clerodendrum serratum L., Verbenaceae)

It is used in treatment of bronchitis, asthma, fevers, blood diseases, tumours, inflammations, burning sensation, epilepsy, malaria, ulcer and wounds. Leaves are used in fever and hiccough. Its boiled leaves are used in cephalgia and ophthalmia whereas its boiled seeds in butter milk are used as aperients, in dropsy and in catarrhal infection of lungs.

Bhallataka (Semecarpus anacardium L.f., Anacardiaceae)

S. anacardium is used to cure lack of interest in sex, low sperm count, and painful menstruation. It is effective for nervous complaints, including forgetfulness, dementia, and psychological trauma.

The tree bark exudes a gum resin used in leprosy, venereal infections and nervous debility, juice from the nut is used in ascites, rheumatism, asthma, neuralgia, epilepsy and psoriasis, as well as for warts and tumours. The caustic oils of nuts of *S. anacardium* are often used in their pure form to treat skin complaints such as warts.

Bibhitaka (Terminalia bellirica (Gaertn.) Roxb., Combretaceae)

Unripe fruit is a mild laxative and ripe fruit is an astringent. Seeds are used as aphrodisiac. Oil extract from the seed pulp is used in leucoderma and alopecia. In bronchial asthma, powder of *T. bellirica* fruit mixed with honey gives immediate relief. Powdered drug is useful in worm-infestation.

Bijaka/Vijayasara (Pterocarpus marsupium Roxb., Fabaceae)

The heartwood finds use in the treatment of diabetes mellitus and inflammation. An aqueous infusion of the wood is said to be of use in diabetes. As astringent it is used in diarrhoea, dysentery, etc. Bruised leaves are applied on skin diseases, sores and boils.

Bilva (Aegle marmelos Correa, Rutaceae)

A. marmelos is traditionally used to treat jaundice, constipation, chronic diarrhoea, dysentery, stomachache, stomachic, fever, asthma, inflammations, febrile delirium, acute bronchitis, snake bite, abdominal discomfort, acidity, burning sensation, epilepsy, indigestion, leprosy, myalgia, small-pox, spermatorrhoea, leucoderma, eye disorders, ulcers, mental illnesses, nausea, sores, swelling, thirst, thyroid disorders, tumours, ulcers and upper respiratory tract infections.

The unripe fruit is medicinally better than the ripe fruit.

Brahmi (Bacopa monnieri L., Scrophulariaceae)

B. monneira is used in the treatment of loss of memory, epilepsy, asthma, ulcers, tumors, ascites, enlarged spleen, indigestion, inflammations, leprosy, anemia, and biliousness and anxiety neurosis.

Bringaraja (Eclipta alba L., Asteraceae)

E. alba is bitter; alterative and anthelmintic. It is useful in inflammations, hernia, eye diseases, bronchitis, asthma, leucoderma, anemia, heart and skin diseases, night blindness, syphilis etc. It is reported as beneficial for

complexion, hair, eyes, and teeth. Expressed juice of *E. alba* mixed with goat's milk is used in frontal sinusitis and nasal catarrh in children.

Brihati (Solanum indicum L., Solanaceae)

The root is bitter, pungent, heating, digestive, astringent to the bowels, anthelmintic, removes foulness of the mouth, beneficial in cardiac troubles, useful in leucoderma, fever, asthma, pain, bronchitis, vomiting and pruritus. Root is carminative and expectorant, useful in coughs and catarrhal infections, dysuria and colic. A decoction of root is prescribed as a tonic and is also used in difficult parturition. Root is pounded and used for the treatment of nasal ulcers. It is one of the ingredients of *Dasamula*.

Dadima (Punica granatum L., Punicaceae)

Rind of the fruit and the bark of the pomegranate tree is used as a traditional remedy against diarrhoea, dysentery and intestinal parasites. Seeds and juice are considered a tonic for the heart and throat, and classified as a bitter-astringent (pitta or fire) component under the Ayurvedic system, and considered a healthful counterbalance to a diet high in sweet-fatty (kapha or earth) components. The astringent qualities of the flower juice, rind and tree bark are considered valuable for a variety of purposes, such as stopping nose bleeds and gum bleeds, toning skin, (after blending with mustard oil) firming-up sagging breasts and treating hemorrhoids. Pomegranate juice (of specific fruit strains) is also used as eye drops as it is believed to slow the development of cataracts. Ayurveda differentiates between pomegranate varieties and employs them for different remedies.

Danti (Baliospermum montanum L., Euphorbiaceae)

Powdered seeds are used as a drastic purgative, one seed being the dose for an adult. But in large doses, they act as an acro narcotic poison. Externally, they are used as a stimulant and rubefacient. Seeds are sometimes substituted for those of *Croton tiglium* L. and are often sold in the market under the same name. Seeds are externally applied in rheumatism as a counter-irritant. Roots are black in colour with thick bark; dried roots vary from 0.6 to 3.8 cm in diam and are collected throughout the year for medicinal use. Root is considered pungent, heating, anthelmintic, diuretic and useful in skin diseases, piles, wounds and enlarged spleen.

Daruharidra (Berberis aristata DC., Berberidaceae)

B. aristata is used to treat ENT infections, wound healing, dysentery, indigestion, uterine and vaginal disorders. It is also used as a tonic and used to cure ulcers and fevers and as an important ingredient of several

polyherbal formulations for treating diarrhoea, cholera and eye diseases including opthalmia and other disorders which are cured by applying the dried extract of the root externally to the eyelids. Tender leaf buds are used to treat dental caries. "Rashut" decoction prepared from root is widely used in Ayurveda.

B. asiatica root has been reported to be efficient against a variety of ailments and diseases such as rheumatism, jaundice, diabetes, fever, stomach disorders, skin disease, and malarial fever. Their roots have been used as antiperiodic, diaphoretic and antipyretic, and bark as tonic and antiperiodic.

Dhanyaka (Coriandrum sativum L., Apiaceae)

External: Local swelling and pains; headache caused by pitta, burning sensation, lymphadenopathy, stomatitis, conjunctivitis and headache. Internal: Vertigo; syncope; memory loss, dyspepsia, worm-infestation, bleeding disorders, cough, dyspnoea and *prameha* caused by biological fire.

Dhataki (Woodfordia fruticosa (L.) Kurz., Lythraceae)

A mixture of *W. fruticosa* powder, honey and rice water is extremely effective in diarrhoea, dysentery and piles. Decoction of flowers effectively quenches the excessive thirst, especially in diabetic patients. These flowers are also useful in fevers, thirst, blood diseases, dysentery, toothache, leprosy, leucorrhoea, and menorrhagia. Charaka and Sushruta used sweetened decoction of flowers for fever, haemothermia, persistent dysentery; included *Dhâtakî* in conception-promoting group of herbs. Powder of *W. fruticosa* flowers, mixed with honey, was prescribed for leucorrhoea. Dried flowers are powdered and dusted over ulcers and wounds to eliminate discharge and promote granulation. Dried flowers are an astringent tonic in disorders of the haemorrhoids, mucous membranes and in derangements of the liver and also considered a safe stimulant in pregnancy.

Draksa (Vitis vinifera L., Vitaceae)

V. vinifera is used in prescriptions for cough, respiratory tract catarrh, subacute cases of enlarged liver and spleen; and in *Âsva*. Red leaves are astringent and anti-inflammatory; an infusion is used for diarrhoea, heavy menstrual bleeding and uterine haemorrhage; also in the treatment of varicose veins and haemorrhoids.

Durva (Cynodon dactylon (L.) Pers, Poaceae)

C. dactylon destroys foulness of breath, useful in leucoderma, bronchitis, piles, asthma, tumours, and enlargement of the spleen,

hysteria, epilepsy, insanity, anuria, biliousness, conjunctivitis, diarrhoea, gonorrhoea, itches and stomachache. Juice is used to arrest bleeding.

Ela (Elettaria cardamomum (L.) Maton, Zingiberaceae)

Powdered *E. cardamomum* mixed with ginger, cloves and caraway is a good stomachic useful in atonic dyspepsia. In herbal medicine, cardamoms are chewed slowly to sweeten the breath, as aphrodisiac, to soothe digestion, stimulate appetite, used against flatulence, colics and disorders of body, often combined with purgatives to offset griping.

Eranda (Ricinus communis L., Euphorbiaceae)

R. communis is a drastic purgatory, used effectively in constipation, hernia, ascites, rheumatoid arthritis, osteoarthritis, enlargement of the abdomen, water retention and eye diseases. It increases appetite and digests toxins.

A decoction of the roots of *R. communis* is used in the treatment of lumbago and sciatica. A poultice of the seeds is applied to the scrofulous sores and boils that result from tuberculosis of lymph nodes. Castor leaves are used as an external application to boils and swellings.

Its oil is also used for dysentery, urinary inflammations, and peritonitis. Topically it is used to treat sore mother's breasts, conjunctivitis (applied to the eye as a poultice), or when mixed with other herbs, it can be appropriately applied in cases of lumbago, sciatica, pleurodynia, and fungal infections.

Gambhari (Gmelina arborea Roxb., Verbenaceae)

Root and bark of *G. arborea* are claimed to be stomachic, galactagogue laxative and anthelmintic; improve appetite, useful in hallucination, piles, abdominal pains, burning sensations, fevers, 'tridosha' and urinary discharge. Leaf paste is applied to relieve headache and juice is used as wash for ulcers. *G. arborea* is recommended in combination with other drugs for the treatment of snake bite and scorpion sting. In snake bite, a decoction of the root and bark of *G. arborea* is given internally.

Goksura (Tribulus terrestris L., Zygophyllaceae)

T. terrestris cures difficult/painful urination, impotence, venereal diseases, seminal-debility, haemorrhoids, headache, conjunctivitis and weak vision, jaundice, diabetes, rheumatoid arthritis, nervousness, hypertension and intercostal neuralgia. Leaves are useful in nephrolithiasis. Ash of whole plant is applied in rheumatic arthritis. Infusion is useful in gonorrhoea. Roots are aperients, demulcent and tonic.

Guduci (Tinospora cordifolia (Thunb.) Miers, Menispermaceae)

Stem is bitter, stomachic, diuretic, stimulates bile secretion, causes constipation, allays thirst, burning sensation, vomiting, enriches the blood and cures jaundice, leprosy, mahajvara, asthma, anorexia, gout, skin infections, jaundice, diabetes, diarrhoea and dyspepsia. The extract of its stem (*amrta* or *guduchi satva*) is useful in skin diseases. It is a traditional belief among the Ayurvedic practitioners that *Guduchi Satva* obtained from *T. cordifolia* growing on *Azadirachta indica* is bitter, more efficacious and is said to incorporate the medicinal virtue of *A. indica*. Root and stem of *T. cordifolia* are prescribed in combination with other drugs as an anti-dote to snake bite and scorpion sting.

Guggulu (Commiphora mukul (Hook. ex Stocks) Engl., Burseraceae)

C. mukul is used in the treatment of a number of atherosclerosis, hypercholesterolemia, rheumatism, osteoarthritis, rheumatoid arthritis, obesity, respiratory diseases, liver disorders, digestive problems and menstrual irregularities.

Haridra (Curcuma longa L., Zingiberaceae)

C. longa is used in the treatment of indigestion, flatulence, languid circulation, bronchitis, amenorrhoea, pharyngitis, toothache, chest pain, blood urine, hemorrhage, skin disorders, diabetes, arthritis, anemia, wounds, bruises, to strengthen the stomach and promote its action, and also as a tonic and blood purifier.

C. longa poultice is often applied locally to relieve inflammation and pain. Fresh juice of *C. longa* is considered to be anthelmintic. Fresh juice of rhizome is used in bronchitis. In rhinitis and cough boiled haridra in milk and mixed with jaggery is given internally. In catarrhal cough, sore throat, and throat infection the decoction of rhizome is used for gargle and also the piece of rhizome is slightly burnt and given for chewing. Turmeric rhizome powder is very useful with amla juice and honey in *madhumeha*. Powder of the rhizome mixed with amla juice is used in jaundice. Corriiyum (anjana) with haridra, red ochre (gairika), and amala (*Emblica officinalis*) cures jaundice.

Haritaki (Terminalia chebula Retz., Combretaceae)

T. chebula is used as adjuvant herb in chronic fever. It is good to increase the appetite, as digestive aid liver stimulant, as stomachic, as gastrointestinal prokinetic agent and mild laxative. It stimulates the liver and protects it further by expelling the waste excretory products from the intestines. It is indicated in protracted diarrhoea with hematochezia and prolapse of rectum. It is a good nervine, used in nervous weakness and nervous irritability. It promotes the receiving power of the five senses. It is helpful in renal calculi, dysurea, and retention of urine and

used for treating parasitic infection. It is used as a blood purifier, gargle for sore throat, ulcerated gums, and muscular rheumatism.

According to Vagbhata, when haritaki powder fried in *ghee* is regularly consumed with sufficient *ghee* in food, it promotes longevity and boosts energy. With sugar water it is used to treat opthalmia, skin itching and edema. It is used as an antioxidant, neuroprotective drug and treatment for heart diseases, inflammation and brain dysfunction. Bronchospasm is mitigated effectively with the combination of haritaki and bibhitaka powders with honey. The decoction of haritaki is used along with honey in hepatitis. Haritaki powder with honey and *ghee* is also effective remedy for anemia. In obesity, its decoction with honey reduces the excessive body fats.

Hingu (Ferula assa-foetida L., Apiaceae)

F. assa-foetida is reputed as a drug which expels gases from the stomach and counteracts any spasmodic disorders. It is also a nervine stimulant, digestive agent and a sedative. Hot water extract of the dried resin is taken orally as an emmenagogue and hot water extract of dried gum is taken orally as a carminative, an antispasmodic, and an expectorant in chronic bronchitis. Dried extract with *Brassica alba* and rock salt is diluted with vinegar and taken orally as an abortifacient. Dried gum resin exudates are eaten to prevent guinea worm disease. Gum resin with salt and the bark juice of *Moringa pterygosperma* is used externally for stomachache.

Jambu (Syzygium cumini (L.) Skeels., Myrtaceae)

All the renowned classic texts of Ayurveda like Charaka Samhita (1000 BC), Sushruta Samhita (600 BC) and subsequent works refer to the disorder under the term *madhumeha* (meaning sugar in the urine). Various parts of *S. cumini* are used, such as bark, fruit, seed and leaves. Almost all the parts of the tree have been used in traditional medicine. Bark and seeds of the tree are known for their popular anti-diabetic agents. Bark is known to freshen up the mouth and is also used to treat disorders of the gums and the teeth.

Dried seeds powder (2 g) reduces polyuria of any cause. Dried seeds powder 1 g per day helps to reduce irritable bowel syndrome. Both seeds and leaves improve uterine function. Regular intake of fruits for 2-3 months help to heal bleeding hemorrhoids. Fruit rind is helpful in alleviating liver enlargement. Seeds decoction with honey prevents thirst and fatigue due to physical strain. Seeds decoction has antiseptic activity. Fruits reduce excessive salivation.

Jatamansi (Nardostachys jatamansi (D. Don) DC., Valerianaceae)

In Ayurveda, *N. jatamansi* is used for nervous headache, excitement,

menopausal symptoms, flatulence, epilepsy and intestinal colic. In combination with cold water, its oil is considered to be effective against nausea, stomachache, flatulence, liver problems, jaundice and kidney complaints, insomnia and headache. Externally, the oil is added to a steaming bath to treat inflammation of the uterus. Oils are also used in eye compounds and as poison antidotes. Oil is reported to be useful in the treatment of an atrial flutter.

Jatiphala (Myristica fragrans Houtt., Myristicaceae)

Nutmeg is aromatic, stimulant, sleep inducing, carminative, intoxicating, digestive tonic and is also an aphrodisiac. Nutmeg oil has been used in dentistry for toothache relief. The oil is also used as a local massage to reduce muscular pain and rheumatic pain of joints. Freshly prepared decoction with honey has been used in nausea, gastritis, and indigestion ailments.

Jiraka (Sveta)-Cuminum cyminum L. (Apiaceae)

In Ayurvedic system of medicine, dried cumin seeds are used for medicinal purposes. Dried cumin seeds are powdered and used in different forms like kashaya (decoction), arishta (fermented decoction), vati (tablet/pills), and processed with *ghee*. It is used internally and sometimes for external application also. It is known for its actions like enhancing appetite, taste perception, digestion, vision, strength, and lactation. It is used to treat diseases like fever, loss of appetite, diarrhoea, vomiting, abdominal distension, edema and puerperal disorders.

Jyotismati (Celastrus paniculatus Willd, Celastraceae)

C. paniculatus as a powerful brain tonic, appetite stimulant, and emetic. Bark is abortifacient, depurative and a brain tonic. Leaves are emmenagogue and the leaf sap is a good antidote for opium poisoning. The seeds are acrid, bitter, thermogenic, emollient, stimulant, intellect promoting, digestive, laxative, emetic, expectorant, appetizer, aphrodisiac, cardiogenic, anti-inflammatory, diuretic, emmenagogue, diaphoretic, febrifuge and tonic, abdominal disorders, leprosy, pruritus, skin diseases, paralysis, cephalalgia, arthralgia, asthma, leucoderma, cardiac debility, inflammation, nephropathy, amenorrhoea, and dysmenorrhoea.

Seed oil is bitter, thermogenic and intellect promoting and is useful in abdominal disorders, beri-beri and sores. Oil from *C. paniculatus* seed has long been valued for its beneficial effects on memory and intellect and treat beri-beri and malaria.

Kalamegha (Andrographis paniculata Nees., Acanthaceae)

Due to alterative property, *A. paniculata* is recommended for use in cases of leprosy, gonorrhoea, scabies, boils, skin eruptions, and chronic

and seasonal fevers. Juice or an infusion of fresh leaves is given to infants to relieve griping, irregular bowel habits, and loss of appetite. Leaves and root are also used in general debility, during convalescence after fevers, for dyspepsia associated with gaseous distension, and in advanced stages of dysentery.

Kampilla (Mallotus philippensis (Lam.) Muell. Arg., Euphorbiaceae)

M. philippensis is used in the treatment of worm infestation, skin diseases, constipation, abdominal tumour, ulcer, hemorrhoids, colic, fever and polyuria.

Kanchanara (Bauhinia variegata L., Fabaceae)

Stem bark of *B. variegata* is used in the treatment of goiter, scrofula, worm-infestation, diarrhoea, dysentery, stomach diseases, wounds and cervical-adenitis.

Kantakari (Solanum xanthocarpum Schrad and Wendl., Solanaceae)

In ancient Ayurveda, *S. xanthocarpum* is described as pungent, bitter, digestive, alternative astringent. Stems, flowers, fruits are bitter, carminative. Root decoction used as febrifuge, effective diuretic and expectorant. Charaka and Sushruta used the extract of entire plant and fruits in internal prescription for bronchial asthma, tympanitis, misperistalsis, piles and dysuria and for rejuvenation. Kantkari Ghrita of Charaka is specific for cough and asthma. The whole plant is used traditionally for curing various ailments. Decoction of the plant is used in gonorrhoea; paste of leaves is applied to relieve pains; seeds act as expectorant in cough and asthma; roots are expectorant and diuretic, useful in the treatment of catarrhal fever, coughs, asthma and chest pain.

Kapikacchû (Mucuna pruriens (L.) DC., Fabaceae)

All parts of *Mucuna* possess valuable medicinal properties. It is used against a wide range of disorders, such as urinary tract, neurological and menstruation disorders, constipation, edema, fever, tuberculosis, ulcers and helminthiasis like elephantiasis.

Roots, according to the Ayurveda, are bitter, thermogenic, anthelmintic, diuretic, emollient, stimulant, aphrodisiac, purgative, febrifuge, and tonic. It is considered useful to relieve constipation, nephropathy, dysmenorrhoea, amenorrhoea, elephantiasis, dropsy, neuropathy, ulcers, helminthiasis, fever and delirium.

Leaves are useful in ulcers, inflammation, cephalagia and general debility. Dried leaves of *M. pruriens* are sometimes smoked. Pod hairs are used as anthelmintic. Hair mixed with honey are used as vermifuge. An ointment prepared with hair act as a local stimulant and mild vesicant.

According to Ayurveda, seeds are astringent, laxative, anthelmintic, aphrodisiac, alexipharmic and tonic.

Karkataksrangi (Pistacia integerrima J.L. Stewart ex Brandis, Anacardiaceae)

P. integerrima is used in indigenous system of medicine as a remedy for cough, asthma, fever, respiratory and in liver disorders. *P. integerrima* finds usage in the treatment of children's ear infections, suppress haemorrhage from gums and used to suppress bleeding from nose. It is useful in pulmonary infections, diarrhoea and vomiting.

Karpura (Cinnamomum camphora (L.) J.Presl., Lauraceae)

C. camphora taken internally in small doses (toxic in large doses) acts as a carminative, reflex expectorant and reflex stimulant of heart and circulation as well as respiration. Also used as a sedative and nervous depressant in convulsions, hysteria, epilepsy, chorea. Topically used as a rubefacient and mild analgesic. Externally, it is used in catarrhal diseases of the respiratory tract and muscular rheumatism; internally in hypotonic circulatory regulation disorders, catarrhal diseases of the respiratory tract.

Katuki (Picrorhiza kurroa Royle ex Benth, Scrophulariaceae)

P. kurroa is used to treat liver and upper respiratory conditions, fevers, chronic diarrhoea, constipation, dyspepsia and jaundice.

Khadira (Acacia catechu (Roxb.) Willd., Mimosaceae)

Heartwood of *A. catechu* is used in conjunctivitis, haemoptysis, catarrh, cough, pruritis, leprosy, leukoderma, skin diseases, helminthiasis, nausea, diarrhoea, dysentery, foul ulcers and wounds, haemoptysis, haematemesis, haemorrhages, fever, anaemia, diabetes and pharyngodynia.

Kiratatikta (Swertia chirata (Wall.) C. B. Clarke, Gentianaceae)

S. chirata is used in the treatment of indigestion, bloating, nausea, liver-diseases, fevers, malarial fever, hysteria and convulsions.

Kumari (Aloe vera (L.) Burm.f., Xanthorrhoeaceae)

A. vera is applied externally in the treatment of mild cuts, insect stings, bruises, poison ivy and eczema.

Internally, it is used in constipation, hemorrhoids, indigestion, menstrual diseases, pruritis, psoriasis, furunculosis, impetigo, type II diabetes, arthritis, eye diseases, tumour, spleen enlargement, liver complaints, vomiting, bronchitis, asthma, jaundice, ulcers, inflammatory bowel diseases, non-ulcer dyspepsia, gastric and duodenal ulcers.

Kupilu (Strychnos nux-vomica L., Loganiaceae)

S. nux-vomica is used in the treatment of anemia, lumbago, asthma, bronchitis, constipation, diabetes, malarial fever, skin disease, paralysis, muscle weakness, and appetite loss.

Kumkum (Crocus sativus L., Iridaceae)

C. sativus is beneficial in the treatment of several digestive disorders. Its use has been found especially valuable in flatulent colic. It is also used in the fevers, melancholia and enlargement of the liver and spleen. It is used in medicines that reduce inflammation. A combination of saffron and *ghee* is used to treat diabetes. Saffron also merits usage in disorders of brain. It has been found beneficial in the treatment of kidney disorders.

Kusmanda (Benincasa hispida (Thunb.) Cogn, Cucurbitaceae)

Leha derived from *B. hispida* is used as a rejuvenative agent and in nervous disorders. The fruit has been used in India for centuries for various ailments such as gastrointestinal problems, respiratory diseases (cough, asthma), heart diseases, vermifuge, diabetes mellitus and urinary diseases.

Lavanga (Syzygium aromaticum (L.) Merrill & Perry, Myrtaceae)

S. aromaticum is used in Indian Ayurvedic medicines, where the essential oil is used as an anodyne (pain killer) for dental emergencies. Cloves are used as a carminative, to increase hydrochloric acid in the stomach and to improve peristalsis. Cloves are also said to be a natural anthelmintic. The essential oil is used in aroma therapy when stimulation and warming are needed, especially for digestive problems. Topical application over the stomach or abdomen are said to warm the digestive tract. Applied to a cavity in a decayed tooth, it also relieves toothache.

Kutaja (Holarrhena antidysenterica Wall, Apocynaceae)

Bark of *H. antidysenterica* has astringent, antidysenteric, anthelmintic, stomachic, febrifugal and tonic properties. It is used in the treatment of amebic dysentery and diarrhoea.

Lodhra (Symplocos racemosa Roxb. Symplocaceae)

Bark is given in female diseases like menorrhagia, metrorrhagia, leucorrhoea and dysfunctional uterine bleeding. It is also used in the treatment of diarrhoea, dysentery, eye diseases, liver complaints, fever, ulcer, scorpion sting, diabetes, and liver disorders.

Madanaphala (Randia dumetorum L., Rubiaceae)

Fruit cures abscess, ulcers, inflammation, wounds, hemorrhoids, tumours, skin-diseases, gastrointestinal tract diseases, wounds and sepsis. Pulp of fruit is believed to have anthelmintic property. Seeds are used as tonic to induce appetite.

The bark is astringent and is used in cases of diarrhoea and dysentery. It is administered internally and applied externally in the form of paste in rheumatism and to relieve pain of bruises and boneaches during fevers and to disperse abscesses.

Manjishtha (Rubia cordifolia L., Rubiaceae)

According to Charaka, the powdered dried roots and fruits are taken internally for the treatment of skin diseases and disorders of spleen.

According to Sushruta, *R. cordifolia* is used for treatment of major burns, bone fractures and dysentery. *R. cordifolia* is considered as tonic, antitussive and useful in chronic low fevers. Decoction from roots is prescribed to cure jaundice, paralytic affections, urinary troubles, amenorrhoea and to the mother after delivery for cleansing and shrinking of the uterus. The root decoction is effective to regulate menstruation cycles.

Marica (Piper nigrum L., Piperaceae)

P. nigrum is used for pain relief, rheumatism, chills, flu, colds, muscular aches and fever. Externally it is used for its rubefacient and as a local application for relaxed sore, throat and some skin disorders.

Markandika (Cassia angustifolia L., Fabaceae)

Herbal tea made from the leaves act as a laxative. It is primarily used in the treatment of constipation and hemorrhoids.

Musali (Chlorophytum borivillianum L., Asparagaceae)

Traditionally, tubers of *C. borivillianum* are used in the treatment of rheumatism and the leaves as vegetable in various culinary preparations. It is traditionally used for its aphrodisiac properties in lack of libido, male impotency, oligozoospermia. It is also widely used as a general health promotive tonic and for delaying the ageing process. Dried root powder increases the lactation amongst the feeding mothers and lactating cows. It also removes the knee pains within a week if taken daily with milk.

Musta (Cyperus rotundus L., Cyperaceae)

C. rotundus is widely used as analgesic, sedative, antispasmodic, antimalarial, stomach disorders and to relieve diarrhoea. The tubers are

used in the treatment of dysmenorrhoea and menstrual irregularities. Infusion is used in pain, fever, diarrhoea, dysentery, an emmenagogue and other intestinal problems.

Nagakesara (Mesua ferrea L., Clusiaceae)

M. ferrea is used in the treatment of dysentery, uterine-bleeding, skin-diseases, erysipelas, fever, emesis, gout, oedema, headache, morbid-thirst and poisoning. It is useful in leucorrhoea. In dysentery, *M. ferrea* is used alongwith honey and sugar.

Nila citraka (Plumbago auriculata L., Plumbaginaceae)

In southern African herbal medicine, a decoction of the aerial parts or roots of *P. auriculata* is taken to treat blackwater fever. A root infusion is taken as an emetic. Root powder is put on warts to make them disappear and is also used as snuff to relieve headache. The powdered, roasted root is rubbed into scarifications over fractures to promote healing, and is rubbed on the body to cure stitch. These treatments are not without danger if large areas are rubbed in, as death by irritation has been recorded. The root extract also acts as a styptic in scrofula.

Nimba or Neem (Azadirachta indica L., Meliaceae)

Neem leaves are useful for chicken-pox, increase immunity of the body, reduce fever caused by malaria, treating various foot fungi, useful against termites, used in curing neuromuscular pains. *Neem* bark and roots are used in the treatment of skin-infections such as acne, psoriasis, scabies, eczema, etc., treats diabetes, AIDS, cancer, heart diseases, herpes, allergies, ulcers, hepatitis and several other diseases.

Hot water extract of the bark is taken orally by the adult female as a tonic and emmenagogue. Anthraquinone fraction of dried flower, fruit and leaf is taken orally for leprosy. Hot water extract of the flower and leaf is taken orally as an anti-hysterical remedy, and used externally to treat wound. The dried flower is taken orally for diabetes.

Hot water extract of dried fruit is used for piles and externally for skin disease and ulcers. Hot water extract of the entire plant is used as anthelmintic, an insecticide and purgative. Juices of bark of *Andrographis puniculata*, *Azadirachta indica*, *Tinospora cardifolia*, are taken orally as a treatment for filariasis. The hot water extract is also taken for fever, diabetes, and as a tonic, refrigerant, anthelmintic. Fruit leaf and root, ground and mixed with dried ginger and 'triphala' is taken orally with lukewarm water to treat common fever. Leaf juice is given in gonorrhoea and leucorrhoea.

Leaves are applied as poultice to relieve boils, their infusion is used as antiseptic wash to promote the healing of wound and ulcers. A paste

of leaves is used to treat wounds, ringworms, eczema and ulcers. Bathing with *neem* leaves is beneficial for itching and other skin diseases. Leaf juice is used as nasal drop to treat worm infestation in nose. Steam inhalation of bark is useful in inflammation of throat. Decoction can cure intermittent fever, general debility convalescent, and loss of appetite after fever. Infusion of flower is given in dyspepsia and general debility.

The tender twigs of the tree are used as tooth brush which is believed to keep the body system healthy, the breath and mouth clean and sweet. Seed oil is used in leprosy, syphilis, eczema and chronic ulcer.

Nirgundi (Vitex negundo L., Verbenaceae)

People sleep on pillows stuffed with *V. negundo* leaves to dispel catarrh and headache and smoke the leaves for relief. Crushed leaf poultice is applied to cure headaches, neck gland sores, tubercular neck swellings, dysmenorrhoea and sinusitis. Essential oil of the leaves is also effective in treatment of venereal diseases and other syphilitic skin disorders. A leaf decoction with *Piper nigrum* is used in catarrhal fever with heaviness of head and dull hearing. A tincture of the root-bark provides relief from irritability of bladder and rheumatism.

Palasa (Butea monosperma (Lam.) Taub., Fabaceae)

Commonly *B. monosperma* is used as tonic, astringent, aphrodisiac and diuretic. Roots are useful in filariasis, night blindness, helminthiasis, piles, ulcer and tumours. Flowers are useful in diarrhoea, astringent, diuretic, depurative and tonic. The stem bark is useful in indigenous medicine for the treatment of dyspepsia, diarrhoea, dysentery, ulcer, sore throat and snake bite. Preparation of *B. monosperma* tubers is used for erectile dysfunction in males.

Palandu (Allium cepa L., Liliaceae)

A. cepa cures vomiting, pain and abdominal tumour. For swelling and inflammations, juice of onion and mustard oil are mixed together in equal quantities and applied to the affected part. In case of nose bleed, juice of *A. cepa* is instilled into the nostrils. For abscess, poultice prepared from roasted onions, turmeric and *ghee* mixed together and applied warm, promotes suppuration in an abscess.

Pasana bheda (Bergenia ligulata (Wall.) Engl., Saxifragaceae)

Leaf juice is used in urinary troubles, cold, hemorrhagic disease, distension of stomach and epilepsy. *B. ligulata* root, rhizome, and whole plant is used for kidney and bladder stones, urinary problems.

Patala (Stereospermum suaveolens DC, Bignoniaceae)

Traditionally, root is used in gastritis, inflammations, heating, dyspnoea, bodyache, vomiting, eructation, piles, acidity, diarrhoea, gonorrhoea, loss of taste, malaria and other fevers. It is reputed for its antipyretic property and is also useful in excessive thirst, cough and asthma.

Patola (Trichosanthes dioica Roxb., Cucurbitaceae)

T. dioica is used in the treatment of headache, ulcer, inflammation, alopecia, burning-syndrome, grey hair, anorexia, morbid-thirst, gastritis, hemorrhoids, liver-diseases, jaundice, abdominal diseases, diarrhoea, worm infestation, bleeding-diathesis, oedema, erysipelas, cough, skin diseases, pruritis, chronic fever, small-pox, general debility and eye diseases.

Pippali (Piper longum L., Piperaceae)

P. longum is most commonly used to treat chronic bronchitis, asthma, constipation, gonorrhoea, paralysis of the tongue. It is advised in diarrhoea, cholera, chronic malaria and viral hepatitis, respiratory infections, stomachache, bronchitis, diseases of the spleen, cough and tumours.

Punarnava (Boerhavia diffusa L., Nyctaginaceae)

B. diffusa rejuvenates liver, male reproductive system and other organ system; detoxifies liver and skin; aphrodisiac; increases libido, erection and quality and quantity of semen; reduces cough, asthma etc. It is used in Vajikarana preparations. This plant cleanses the kidneys and helps to get rid of renal calculi.

Mainly, the roots or the whole plant is used for the medicinal purpose, externally *B. diffusa* is used to alleviate the pain and swelling. Fresh juice of its roots instilled into eyes, mitigates the ailments of the eyes like night blindness and conjunctivitis. The paste applied on the wounds, dries up oozing.

Internally, *B. diffusa* is beneficial to treat a wide range of diseases. It is the most commonly used and the best herb to alleviate swelling, due to its potent diuretic property. Sesame oil, medicated with *B. diffusa* is very useful as an adjunct to oleating enemas in the treatment of ascites of *vâta* type and flatulence.

In large doses, *B. diffusa* acts as a purgative. *B. diffusa* effectively reduces fever, especially in malaria. Decoction of *Pluchea lanceolata*, *Zingiber officinale* and *B. diffusa* is the best for rheumatic swollen joints.

Raktacandan (Pterocarpus santalinus L.f., Fabaceae)

P. santalinus is used in the treatment of skin and blood disorders, fever and diarrhoea other traditional uses are in: cough, vomiting, fever, hyperdipsia, helminthiasis, diseases of the blood and eye, wounds, and edema. Medicated oil extracted from the plant is used in patches on the body due to spider bite.

Raktacitraka (Plumbago rosea L., Plumbaginaceae)

P. rosea is considered vesicant, stimulant, sialagogue and sudorific. Roots considered abortifacient and antifertility. Juice of the root is acridly pungent to taste, producing a severe, lancinating pain of tongue. Juice of the root is blistering to the skin. Leaves and stems are pungent in taste, but not as virulent as the root. Bark considered antidyspeptic.

Rasna (Pluchea lanceolata L., Asteraceae)

P. lanceolata is used in the Ayurveda as laxative, analgesic, antipyretic, nervine tonic, aperient, for the treatment of rheumatism and allied disorders, diseases of the abdomen, dyspepsia, bronchitis, inflammation and arthritis.

Rasona (Allium sativum L., Liliaceae)

In Ayurveda, *A. sativum* is used internally for colds, coughs, whooping coughs and bronchitis. Garlic also finds application in digestive ailments with bloating and convulsive pain. Other uses include menstrual disease, diabetes, tonic, externally for corns, warts, muscle pain, arthritis, and sciatica.

Saireyaka (Barleria prionitis L., Acanthaceae)

In indigenous system of medicine in India, juice of *B. L. prionitis* leaves is used in stomach disorders, urinary infections, ulcer and fever. Leaf juice mixed with honey is given to children in catarrhal infections and fever. Leaves are chewed to relieve from toothache. Some tribal communities use leaves for the treatment of piles and reduce irritation. Leaf juice is applied externally in lacerated soles of feet and pimples. Dried stem bark is used as an expectorant in whooping cough and diaphoretic. Aerial parts of this plant are also used in inflammations and gastrointestinal disorders. Its root paste is externally applied to disperse boils and glandular swellings.

Its flowers are used internally for the treatment of migraine, internal abscesses, oedema, haemoptysis, urethral discharges, seminal disorders and reduce obesity. Whole plant is also used in stiffness of limbs, enlargement of scrotum and sciatica. Whole plant, specifically the roots are used as diuretic and tonic. It is also used in urinary infection, jaundice, hepatic obstruction and dropsy.

Saptaparna (Alstonia scholaris R. Br., Apocynaceae)

The decoction of *A. scholaris* bark has been used to treat cold and other ailments like fever. In Ayurveda, it is used as a bitter and astringent herb for treating skin disorders, malarial fever, urticaria, chronic dysentery, diarrhoea, in snake bite. At one time, a decoction of the bark was used to treat diarrhoea and malaria, as a tonic, febrifuge, emmenagogue, anticholeric and vulnerary. A decoction of the leaves was used to treat beri beri. Ayurveda recommends *A. scholaris* for bowel complaints. Bark is useful in malarial fevers, abdominal disorders, dyspepsia and skin diseases.

Sarpagandha (Rauvolfia serpentina (L.) Benth. ex Kurz, Apocynaceae)

According to Ayurveda *R. serpentina* root is bitter, acrid, heating, sharp, pungent and anthelminic. Drug Rauvolfia consists of air-dried roots. Rauvolfia preparations are used as antihypertensive and as sedative. It is also used for the treatment of various central nervous system disorders associated with psychosis, schizophrenia, insanity, insomnia, and epilepsy.

Sariva (Hemidesmus indicus (L.) R. Br., Asclepiadaceae)

Roots of *H. indicus* are used in the diseases of blood, inflammation, diarrhoea, respiratory disorders, skin diseases, syphilis, fever, bronchitis, asthma, eye diseases, epileptic fits in children, kidney and urinary disorders, loss of appetite, burning sensation and rheumatism. It has also been used in combination with other drugs for snake bite.

Salaparnî (Desmodium gangeticum DC, Family: Fabaceae)

D. gangeticum is used as a bitter tonic, febrifuge, digestive, anti-catarrhal, antiemetic, anti-inflammatory chest and various other inflammatory conditions due to vata disorders. Root is prescribed in combination with other drugs for the treatment of gastric ulcer, snake bite and scorpion sting. Root powder mixed with honey is applied frequently to treat mouth ulcer.

Salmali (Salmalia malabarica (DC) Schott and Endl., Bombacaceae)

Paste of bark of *S. malabarica* is used for anti-inflammatory activities. Powder of stem prickles is used to treat asthma and seed paste prepared in water is applied on small-pox boils. Extract of bark and flower is used for men and women with sexual diseases like hydrocele, impotency, spermatorrhoea, sterility, nocturnal emission, leucorrhoea, gonorrhoea and to check menstrual disorders in women.

Bark juice of *S. malabarica* is applied locally for the treatment of wounds; its bark juice is mixed with that of mango and guava and drunk to cure dysentery and intestinal spasm. The resins are taken orally to treat worms and diarrhoea; root juice is consumed to treat abdominal pain and gonorrhoea. Root powder mixed with sucrose and milk is taken to avoid impotency.

Sankha puspi (Convolvulus pluricaulis Choisy., Convolvulaceae)

C. pluricaulis is used to treat various disorders related to nervous weakness, stress, dementia, hypertension, depression, anxiety neurosis, insomnia, mental as well as physical fatigue, loss of memory etc. Primarily, it is used as a brain tonic.

Satavari (Asparagus racemosus Willd., Asparagaceae)

A. racemosus is used in treatment of epilepsy, kidney disorders, ulcer, gout, chronic fevers, excessive heat, stomach ulcers and liver cancer, increases milk secretion in nursing mothers and regulates sexual behaviours. *A. racemosus* cleanses, nourishes, and strengthens the female reproductive organs and so, it is traditionally used for PMS, amenorrhoea, dysmenorrhoea, menopause and pelvic inflammatory disease like endometriosis.

Satapuspa (Anethum sowa Kurz, Apiaceae)

A. sowa is used in gastrointestinal ailments such as flatulence, indigestion, stomachache and colic. The fruit has an antispasmodic effect on the smooth muscle of the gastrointestinal tract with regard to central nervous system. It is also used as galactagogue.

Sigru (Moringa olifera Lam., Moringaceae)

External application of *M. olifera* is recommended in inflamed conditions like wounds, joint pain and arthritis. Seed powder is administered through nose during nasya karma to reduce headache. Leaves and bark of this plant are used in ayurvedic treatment methods implemented for paralysis, nervous debility and other nerve disorders. Leaves and fruits increase digestion, appetite and reduce stomach cramps. Seeds of drumstick help to eradicate intestinal worms. Tea prepared with *Moringa* leaves is used in treating diarrhoea, gastric ulcers and stomach pain. *Moringa* oil is used in treating syphilitic wounds, scurvy, hysteria, bladder problems, prostate problems, fungal infections and certain skin complaints.

Sirisa (Albizia lebbeck (L.) Benth., Fabaceae)

A. lebbeck is an astringent, also used by some cultures to treat boils, cough, to treat the eye, flu, gingivitis, lung problems, erysipelas, hiccup,

breathlessness, pectoral problems, is used as a tonic, and is used to treat abdominal tumours. An infusion (hot or cold) from the bark and roots is used to treat scabies, inflamed eyes, and bronchitis.

Svetacandan (Santalum album L., Santalaceae)

S. album is used in treatment of diarrhoea with bleeding, intrinsic hemorrhage bleeding piles, vomiting, poisoning, hiccoughs initial phase of pox, urticaria, eye infections and inflammation of umbilicus.

Sveta citraka (Plumbago zeylanica L., Plumbaginaceae)

In Ayurveda *P. zeylanica* is used against anaemia, rheumatic pain, sprains, dysmenorrhoea, carbuncles, scabies, leprosy, contusion of the extremities, inflammation, ulcers and elimination of intestinal parasites. Roots of the plant are antiatherogenic, cardiogenic, neuroprotective and central nervous system with stimulating properties. In Indian system of medicine, the plant has been recommended for the treatment of various ailments such as dyspepsia, piles, diarrhoea, skin diseases and used in formulations of a number of Ayurvedic compounds. It is said to increase digestive power and improve appetite.

Syonaka (Oroxylum indicum (L.) Vent., Bignoniaceae)

Root bark has tonic and astringent properties and useful in diarrhoea and dysentery; used as diaphoretic and also in rheumatism. Tender fruits of this plant have refreshing and stomachic properties, while the seeds have purgative property. Roots of *O. indicum* are used as one of the ingredients in Ayurvedic formulations.

Talisa patra (Abies webbiana (Wall ex D. Don) Lindl., Pinaceae)

A. webbiana is applied externally in headache. Internally, it is used in anorexia, flatulence, loss of appetite, cough, asthma, hoarseness of voice and tuberculosis.

Tila (Sesamum indicum L., Pedaliaceae)

Root, leaves, seed and oil are used for skin diseases, hemorrhoids, ulcers, migraine, stomachache, amenorrhoea, burns, cholera, constipation, cough, dysentery, dysmenorrhoea, gonorrhoea, hemorrhoids, scalds, ulcers, wounds, rheumatic pains and dandruff. Oil is used for viper treatment for vomiting the blood and preparing medicated oil. The oil is used as a vaginal douche to help maintain healthy vaginal balance.

Trivarta (Operculina turpethum (L.) Silva Manso, Convolvulaceae)

O. turpethum is used to treat fevers, edema, ascites, anorexia, constipation, hepatosplenomegaly, intoxication, haemorrhoids, fistula,

anemia, obesity, abdominal tumors, ulcers, worm infestation, pruritus and other skin disorders. It is the best amongst the herbs used for Virechana (i.e. therapeutic purgation), one of the procedures of Panchakarma therapy.

Tulasi (Ocimum sanctum L., Lamiaceae)

Leaves are diaphoretic, anti-periodic; also used in stress, bronchitis, gastric and hepatic disorders. Decoction of leaves is recommended for cough, malaise and in colds. It is a good mosquito repellant as well. Oil extracted from flowers is used in skin diseases and ring-worm infection. Paste prepared from *O. sanctum* leaves is used against the ringworm infection. *Tulsi* removes worms and parasites.

Leaf juice of *O. sanctum* along with *triphala* is used as an eye tonic and is recommended for glaucoma, cataract, chronic conjunctivitis and other diseases associated with eyes. Chewing 3-4 of leaves before a meal helps stimulating the appetite, and a tea taken after a meal promotes digestion by increasing the flow of gastric juices, while reducing gas and bloating.

O. sanctum reduces the chances of ulcers. It is an active diaphoretic. It removes excess cough from lungs and nasal passages. A decoction of *O. sanctum* leaves is a popular remedy for common cold in India. It is also used in fever along with the clove. It also lowers the uric acid levels and hence is considered as a potential anti-inflammatory agent.

Leaves of *O. sanctum* are specific for many fevers. During the rainy season, when malaria and dengue fever are widely prevalent, tender leaves, boiled with tea, act as preventive against these diseases. In case of acute fevers, a decoction of the leaves boiled with powdered cardamom brings down the temperature, hence, it has been considered as a potential antipyretic cocktail as a home remedy.

O. sanctum is an important constituent of many cough syrups and expectorants. It helps to mobilize mucus in bronchitis and asthma. Chewing tulsi leaves relieves cold and flu. The leaves are nerve tonic and also sharpen memory. They promote the removal of the catarrhal matter and phlegm from the bronchial tube. It is useful in teeth disorders and is also recommended as a remedy against pyorrhoea. Also, *O. sanctum* is used as a remedy for night blindness and conjunctivitis.

Tvak (Cinnamomum zeylanicum Breyn., Lauraceae)

Cinnamon bark is used for gastrointestinal upset, diarrhoea, and gas. It is also used for stimulating appetite; for infections caused by bacteria and parasitic worms; and for menstrual cramps, the common cold, and influenza.

Usira (Vetiveria zizanonoides (L.) Nash, Poaceae)

V. zizanonoides is used in mouth ulcer, hyper acidity, urinary tract infection, toothache, fever, boil, epilepsy, burn, snake bite, scorpion sting, rheumatism and headache.

Vaca (Acorus calamus L., Acoraceae)

A. calamus is used for the appetite and as an aid to the digestion. It is used for fevers, stomach cramps and cholic. Its rhizomes are used for toothache and powdered rhizome for congestion. Rhizome part is also used to treat several diseases like asthma and bronchitis and as sedative. *A. calamus* has the property of improving the memory power and intellect. It is used in the stomatopathy, hoarseness, flatulence, dyspepsia, helminthiasis, amenorrhoea, dysmenorrhoea, nephropathy, calculi and stragury.

Varuna (Crataeva religiosa Forst. f., Capparaceae)

Its root bark is rubefacient and counter-irritant. Extract of root bark mixed with honey, is applied to scrofulous enlargement of glands. Stem bark is hot, bitter at first and then sweet sharp taste, easy to digest, stomachic, laxative, antilithic, vesicant, antihelminthic, detergent, bechic, expectorant; good in strangury, disease of chest, blood, tuberculous glands; causes biliousness.

Bark is useful in some cases of urinary complaints, fever, mild form of skin disease, relieves vomiting, symptoms of gastric irritation, promotes appetite and decreases secretion of bile and phlegm. Bark is diuretic, finds application in urinary disorders; including urolithiasis, prostatic hypertrophy, urinary infections, uterine and gastro intestinal problems.

In arthritis, paste of bark powder is prepared and applied externally. In abscess, bark decoction and honey is taken orally. Bark scrubbed in curd is applied to remove black spots from the skin.

Vasa (Adhatoda vasica Nees, Acanthaceae)

All parts of the plant are used in medicine and particularly the leaves are credited with insecticidal and parasitocidal properties. Root is useful in strangury, leucorrhoea, bronchitis, asthma, bilious vomiting, sore eyes, fever and gonorrhoea. It is a valuable antiseptic, antiperiodic and anthelmintic.

In Ayurveda, a preparation made from *A. vasica* flowers, known as gulkand is used to treat tuberculosis. Juice from its leaves should be given in doses of 2 to 4 g in treating diarrhoea and dysentery. A poultice of its leaves is applied with beneficial results over fresh wounds, rheumatic joints and inflammatory swellings. A warm decoction of its leaves is useful in treating scabies and other skin diseases.

Vatada (Prunus amygdalus Batsch, Rosaceae)

P. amygdalus is a useful food remedy for anaemia. It is beneficial in the treatment of constipation and various skin diseases like eczema, pimples. Almonds are also useful in treating gastro-enteritis, kidney pains, diabetes, head lice, facial neuralgia and gastric ulcers.

Vatsanabha (Aconitum ferox Wall. ex Ser., Ranunculaceae)

A. ferox is used as antipyretic, analgesic, appetizer and a digestive. *A. ferox* root is always used after purification in Ayurvedic preparations.

Vidarikanda (Pueraria tuberosa (Roxb. ex Willd.) DC., Fabaceae)

In Ayurveda, the tubers of *P. tuberosa* are described as sweet, refrigerant, emollient, laxative, aphrodisiac, galactagogue, diuretic, emetic, cardiogenic, expectorant, febrifuge and used for the treatment of hepatosplenomegaly, leprosy, dyspepsia, spermatorrhoea, tuberculosis and cough.

Vidanga (Embelia ribes Burm.f., Myrsinaceae)

Dried fruit is considered anthelmintic, astringent, carminative, alternative and stimulant. It has been employed in Ayurveda since ancient times, as anthelmintic and is administered as powder, usually with milk, followed by a purgative.

E. ribes is used in dryness of the bowels, constipation, colic and flatulence as well as in kaphaja polyuria and obesity. Due to its pungent properties *E. ribes* is an effective sialagogue and digestive stimulant, both the roots and fruit used in anorexia as well as a powder in the treatment of dental caries as a dentifrice.

Yastimadhu (Glycyrrhiza glabra L., Fabaceae)

G. glabra is tonic, diuretic, demulcent, expectorant, emenagogue and laxative. Used for allaying coughs and catarrhal infections. It is useful in irritable conditions of mucous membrane of urinary organs. Useful in sore throat, cough, anorexia and persistent low fever. *G. glabra* is prescribed to patients suffering from constipation.

Yavani (Trachyspermum ammi Sprague, Apiaceae)

T. ammi is stimulant, antispasmodic and carminative, and used for flatulence, atonic dyspepsia, diarrhoea, abdominal tumours, abdominal pains, piles, and bronchial problems, lack of appetite, galactagogue, asthma and amenorrhoea.

Ethnobotany of Medicinal Plants used in Amchi System of Medicine

Amchi System of medicine (ASM) or Tibetan Medical System (TMS) is one of the practicing systems of complementary and alternative medicine (CAM), also known as Sowa Rigpa (classical Tibetan), which means "science of life". Amchi signifies doctor or physician. Fundamental aspects of Amchi system of medicine are similar to traditional Indian Medicine (TIM) or Ayurveda. It is estimated that Amchi System of medicine is the outcome of aspects of medicine that were transmitted from India to Tibet between the 7th and 12th centuries.

Acantholimon lycopodioides (Girard) Boiss. (Plumbaginaceae)

Plant ash is used with milk in cardiac disorders.

Aconitum naviculare (Brühl) Stapf (Ranunculaceae)

Tubers are prescribed in fever, gall bladder disorder, food-poisoning and communicable diseases.

Ajuga lupulina Maxim. (Lamiaceae)

Leaf is used in the treatment of fever, sinusitis, infections, menstrual disorders, swellings, skin diseases and paralysis.

Allium carolinianum DC. (Alliaceae)

Leaves are used against indigestion.

Allium hypsistum Stearn (Alliaceae)

Whole plant is used in cough and gastritis.

Allium prezewalskinam Regel. (Alliaceae)

Leaves are used against indigestion.

Allium stoliczkai Regel (Alliaceae)

Decoction of dried bulb is given to women after delivery for energy. A decoction of the leaves is considered a remedy for constipation.

Anaphalis triplinervis (Sims) C.B. Clarke (Asteraceae)

Leaf and flower are used as diuretic and heat therapy.

Androsace muscoidea Duby (Primulaceae)

Flowers are used in fever and urinary problems.

***Androsace strigillosa* Frach (Primulaceae)**

Flower and leaf are used in fever, body swelling and lymph disorder.

***Anemone rivularis* Buch.-Ham. ex DC. (Ranunculaceae)**

Fruit and seed are used in wound, accumulation of serous fluid in the body, gastritis, liver and bile disorders, cough, cold and for heat production.

***Anemone rupicola* Camb. (Ranunculaceae)**

Seeds are used in indigestion.

***Anthriscus nemerosa* Spreng. (Apiaceae)**

Sun-dried plants are powdered. It is claimed that the smoke of the powder, when inhaled, cures rheumatism and inflation.

***Arisaema flavum* (Forsk.) Schott (Araceae)**

It is used in fever, stomach problems, swelling, skin diseases, scabies, bone disease, uterus and menstrual disorders.

***Arisaema jacquemontii* Blume (Araceae)**

Root, rhizome and flower are used in the treatment of fever, stomach problems, swelling, toothache, scabies, chest infection, uterus and menstrual disorders, worm infestation and throat problems.

***Artemisia biennis* Willd. (Asteraceae)**

Its root is used in cough and cold.

***Artemisia brevifolia* Wall. ex DC. (Asteraceae)**

Leaves extract is used in Amchi medicine against stomach problems and internal worms.

***Aster diploslephoides* Benth. (Asteraceae)**

Flowers are used in Tibetan medicine, they are said to have a bitter taste and a cooling potency. They are antidote, febrifuge, haemostatic and tonic, and used in the treatment of infectious fevers, influenza, nose bleeds, poisoning, sores from environmental poisoning and an inability to stretch or contract the limbs. Dry or fresh flower heads are boiled in milk with a little sugar. The decoction is administered to patients suffering from cough and a low rate of respiration.

***Aster flacidus* Bunge (Asteraceae)**

Flowers are used for treating infections, common cold and poisoning.

***Aster stracheyi* Hook.f. (Asteraceae)**

Flower and leaf are used in wounds, poisoning, contagious fever and headache.

***Astragalus zanaskariensis* Benth. (Fabaceae)**

Its sun-dried roots are powdered and dissolved in lukewarm milk and given to expel intestinal worms. Extract of fresh roots is claimed to be effective against ring worm.

***Berberis erythroclada* Ahrendt (Berberidaceae)**

Bark is used for gall bladder and eye diseases.

***Berberis ulicina* HK. f. and T (Berberidaceae)**

Dried fruits are administered orally against ring-worm.

***Capparis spinosa* Lamk. (Capparidaceae)**

Its leaves are placed in water for 2-3 days with continuous changing of water. Then leaves are boiled in fresh water with a little salt and used against hyperacidity and other stomach troubles.

***Caragana gerardiana* Royle ex Benth. (Fabaceae)**

Heart wood is used in blood pressure, menstrual disorder, skin diseases, cough, heart pain, blood disorder and eye problems.

***Caragana jubata* (Pall.) Poir. (Fabaceae)**

Heart wood is used in blood pressure and menstrual disorders.

***Caranga moorcroftiana* Benth. (Fabaceae)**

Fresh leaves are boiled in milk and cooled. Taken in the morning for a week, it is claimed to act as a blood purifier. Dry leaves are used as an antiseptic in powdered form.

***Carduus nutans* L. (Asteraceae)**

Fresh leaves and roots are chewed to initiate vomiting in cases of indigestion.

***Centuria depressa* M. Bieb. (Asteraceae)**

Luke warm extract of fresh leaves and seeds is used against cough, chest pains and fever.

***Chenopodium album* L. (Chenopodiaceae)**

Leaves are boiled in water and cooled overnight. It is given against gastric troubles. An extract from seeds is used as a diuretic.

***Cicer microphyllum* Benth. (Fabaceae)**

Seeds are considered as a good source of lecithin.

***Cicerbita macrorhiza* (Royle) P Beauv (Asteraceae)**

The plant is used as febrifuge.

***Clematis tibetana* Kuntze (Ranunculaceae)**

Its stem and flowers are used in the treatment of skin irritations and itches, and tumours.

***Delphinium brunonlanum* Royle (Ranunculaceae)**

Fresh leaves are crushed in a little water and made into a paste. The paste is used with bread against malaria.

***Delphinium viscosum* Hk. f. and T. (Ranunculaceae)**

Fresh shoots and leaves are made into a paste. The paste is applied as a poultice on inflamed joints to relieve pain and oedema.

***Dracocephalum heterophyllum* Benth. (Lamiaceae)**

Leaf and flowers are given in oral diseases, toothache and liver disorder.

***Dracocephalum tanguticum* Maxim. (Lamiaceae)**

Flower and stem are given in fever, stomach problems and as blood purifier.

***Echinops cornigerus* DC. (Asteraceae)**

Seeds are used as tonic. Paste of leaves is applied on septic wounds.

***Elaeagnus angustifolia* L. (Elaeagnaceae)**

Flower extract is used in treatment of malignant fevers. Fruits are known to contain vitamin- A, C and E.

***Ephedra gerardiana* Wall. (Ephedraceae)**

Decoction of aerial parts is used against bronchial troubles and liver diseases. It is also claimed to cure irregularities of menstruation.

***Gentiana algida* Pall. (Gentianaceae)**

It is used in lung disorder and skin diseases.

***Gentiana robusta* King ex J. D. Hooker (Gentianaceae)**

It is used in diarrhoea, food poisoning, headache, tuberculosis, urinary system and bile disorder, swelling, cough and fever.

***Gentianella moorcroftiana* (Wallich ex G. Don) Airy Shaw (Gentianaceae)**

Infusion of plant is put on the baby's forehead to reduce fever.

***Gentianella paludosa* (Hook. f.) H. Smith (Gentianaceae)**

Root is used in headache.

***Geranium donianum* Sweet (Geraniaceae)**

Root is used in fever, cough and bodyache.

***Geranium nakaoanum* Hara (Geraniaceae)**

Root is used in fever, cough and bodyache.

***Geranium pretense* L. (Geraniaceae)**

Root is used in fever, cough and bodyache.

***Halenia elliptica* D. Don (Gentianaceae)**

Leaf and stem are used in liver and bile disorders, fever, headache, cough and cold.

***Hippaphae rhamnoides* L. (Elaeagnaceae)**

Regular consumption of fresh fruits is claimed to be effective against asthma.

***Hippophae tibetana* Schlechtendal (Elaeagnaceae)**

Fruit and seed are used in gastritis, chest pain, lung problem, digestive disorder, liver pain, fever, blood purification, and for external use on skin for bone pain.

***Hodgsonia macrocarpa* (Bl.) Cogn. (Cucurbitaceae)**

Infusion of roots and seeds is used for malaria and typhoid.

***Incarvillea arguta* (Bignoniaceae)**

Whole plant juice is used in tooth decay.

***Incarvillea younghusbandii* Sprague (Bignoniaceae)**

Root and fruit are used in cough, ear problem and for quick release of placenta.

***Iris lacteal* Pall. (Iridaceae)**

Dried flowers are used as in an ingredient to remedy diuretic laxative. Seeds are used to treat many ailments including; fever, jaundice, menorrhagia, heat pain, nausea, sore throat, vomiting, urination, carbuncles and boil problems. It has also been used in anti-cancer drug 'Irisquinone' (Fig 43) which comes from a herbal remedy.

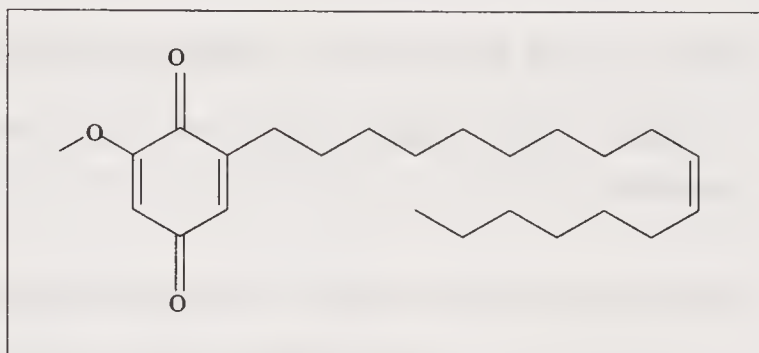


Fig 43. Structure of irisquinone

***Jaeskea oligosperma* (Grisb) (Gentianaceae)**

The plants are consumed raw or sometimes prepared with milk and it is claimed to act as a blood purifier.

***Juglans regia* L. (Juglandaceae)**

Dry kernel is roasted directly on fire and used for treatment of constipation. Bark in powder form is used as a tooth powder.

***Juniperus macropoda* Boiss. (Cupressaceae)**

Extract of fresh seeds along with the seed extract of *Polygonum hydropiper* is used as diuretic.

***Lactuca sativa* L. (Asteraceae)**

Leaves are boiled in water with salt and allowed to cool. They are crushed and used against fever, sometimes used against lack of appetite.

***Lagotis kunawurensis* Royle ex Benth. (Scrophulariaceae)**

The whole plant is used in diarrhoea, tuberculosis, pyrexia of unknown origin and excess bleeding from the wound.

***Lancea tibetica* Hook. F. et Thoms (Scrophulariaceae)**

Fruits are used for cardio-diseases and retention of menses.

***Lasia spinosa* (L.) Thw. (Araceae)**

The boiled plant is taken as food to expel worms and parasites from intestine.

***Lepidium latifolium* Linn. (Brassicaceae)**

The plants are crushed and made into a paste and applied as a poultice to cure rheumatism.

***Lonicera hypoleuca* Decne. (Caprifoliaceae)**

Whole plant is used in kidney problems.

***Macaranga bicolor* (G. Don) A. DC (Boraginaceae)**

It is used in the Nepalese ethnomedicine for the treatment of several diseases.

***Meconopsis horridula* Hook (Papaveraceae)**

Root, leaf and flower are used in bone fracture, kidney problems and to remove accumulated body fluid and as a pain killer.

***Morina longifolia* Wall (Morinaceae)**

Seeds are crushed to obtain oil, which is claimed to be nutritive for children of 3-6 years of age.

***Myricaria germanica* (Linn.) Desr (Tamaricaceae)**

A decoction of the leaves is taken as a blood purifier.

***Neopicrorhiza scrophulariiflora* (Pennell) DY Hong (Scrophulariaceae)**

This plant is found in the inventory of medicinal plants used in the Amchi system of medicine. It is among rare plants used in the Amchi system of medicine, which has been investigated phytochemically.

***Nepeta brachypetala* Benth. (Lamiaceae)**

Seeds are dried, powdered and boiled in water. On cooling, the extract is used against hyperacidity.

***Nepeta glutinosa* Benth. (Lamiaceae)**

Decoction of dried leaves is used against diarrhoea.

***Onosma hispidum* Wall. (Boraginaceae)**

Fresh roots and leaves are boiled in milk and stored overnight. The decoction, if taken before breakfast, is claimed to stop blood vomiting and act as a blood purifier.

***Oxyria digyna* (L.) Hill. (Polygonaceae)**

Shoots are kept in lukewarm water and taken in the morning as an appetizer.

***Pedicularis oederi* Vahl. (Scrophulariaceae)**

Fresh seedlings are consumed raw in case of food poisoning.

***Phlomis rotata* Benth. ex Hook (Lamiaceae)**

Flower and leaf are used in bone problems, accumulation of serous fluids in the bone, skin and wound part of the body, headache, fever, cough, worm infections and swelling caused by cold.

***Physochlamia praeala* (Decne) Hiers. (Solanaceae)**

Leaves are narcotic and used in ulcer and eye-diseases.

***Plantago asiatica* L. (Plantaginaceae)**

The cooked or boiled leaves are used as a blood purifier.

***Plantago himaliaca* L. (Plantaginaceae)**

Dried seeds are powdered, dissolved in curd and used to cure diarrhoea.

***Polygonum hydropiper* L. (Polygonaceae)**

Seeds are placed in water and boiled for 2-3 days. On cooling, the extract is used as a diuretic and to decrease obesity.

***Potentilla anserina* L. (Rosaceae)**

Roots of the plant are eaten raw, especially by children. Roots are used as a tonic against diarrhoea.

***Potentilla fruticosa* L. (Rosaceae)**

Stem, leaf and flower are given in breast diseases, stomach and lung disorders, indigestion and dysentery. Plants are also used as incense. Leaves are used as a substitute for tea.

***Primula macrophylla* var. *macrophylla* Yasin J. Nasir (Primulaceae)**

The whole plant is used in food poisoning, fever, indigestion, dysentery and ulcer.

***Primula sikkimensis* Hook. (Primulaceae)**

Flowers are used in fevers of lung, blood vein disorders and diarrhoea.

***Prunus americana* L. (Rosaceae)**

Oil extracted from the seeds (kernels) is given to women after delivery for energy. It is also used to stimulate growth of long, healthy hair.

***Pterocephalus hookeri* (C.B. Clarke) Höeck. (Dipsacaceae)**

Whole plant (leaf, flower and fruit) is used in food poisoning, fluid accumulation in the body, cough, cold, contagious fever, infection, dysentery, gout, arthritis, and blood disorders.

***Rheum australe* D. Don (Polygonaceae)**

Whole plant (root and petiole) is used in bone fractures, sprain, indigestion, bloated stomach, gastritis, swellings, sores, menstrual and blood disorders, bile fever and as anthelmintic. Leaf stalks are eaten raw and used as pickle. Roots are used as substitute of tea. Also used for colouring wool and as fixative.

***Rheum moorcroftianum* Royle. (Polygonaceae)**

Root is used in fever, gastritis and swellings. Leaf stalks are eaten raw and used as pickle. Roots are used as substitute of tea.

***Rheum spiciforme* Royle. (Polygonaceae)**

Its roots are used as dye for colouring clothes. Purple roots are used in Amchi medicine against rheumatism.

***Rhodiola tibetica* Hk. f and T (Crassulaceae)**

Roots are used in medicine as a health tonic.

***Rhodiola imbricata* Edger. (Crassulaceae)**

Roots are used against cold, cough, fever and lung problems.

***Rhododendron anthopogon* D. Don (Ericaceae)**

In Nepal, the leaves are boiled and the vapours inhaled to treat coughs and colds. Also used in stomach, liver and lung disorders, tuberculosis, indigestion, antiallergic against potato, vomiting, appetizer, sore throat, phlegm disease, as pain killer and longevity.

***Rhododendron lepidotum* Wall. ex. D. Don (Ericaceae)**

It is used as digestive and an appetizer and in bile and lung diseases, back pain, cold and blood disorders and bone disease.

***Rhododendron nivale* Hook. (Ericaceae)**

It is given in sinusitis, arthritis, gout and the common cold.

***Rosa macrophylla* Lindl. (Rosaceae)**

It is used in fever, diarrhoea and bile disorders. Fruits can be taken raw and also used for making wine.

***Rosa sericea* Lindl. (Rosaceae)**

Flower, fruit and bark are used in fever, jaundice, liver, bile, wind and lung diseases, menstrual disorders, poisoning, lymph fluid disorder and as a tonic. Ripe fruits can be taken raw. Flowers are used as a facial wash. This plant is used as herbal tea.

***Rosa webbiana* Wall. ex. Royle (Rosaceae)**

The plant is used for treatment of hepatitis and is a good source of vitamin C.

***Rubus foliolosum* (Rubiaceae)**

It is used in fever, dyspepsia, cough, cold and vertigo.

***Rumex nepalensis* Spreng (Polygonaceae)**

The whole plant is used in fever, cough, blood clotting, excretory system and oral disorders, joint pain, and wounds. Leaf stalks are eaten raw and used as a pickle.

***Rumex patientia* L. ssp. *tibeticus* Rech. f. (Polygonaceae)**

Roots are used in oedema and constipation.

***Salvia hians* Royle ex. Benth. (Lamiaceae)**

Leaf is prescribed in eye infection.

***Saussurea taraxicifolia* Wall. (Asteraceae)**

Sun dried rhizomes are powdered and added to pre-boiled milk. It is kept as such for 1-3 days and then used against fever.

***Saxifraga flagellaris* Willd. (Saxifragaceae)**

Fresh aerial parts are crushed on a stone; a little water is added so that a paste is formed. It is applied on cuts and wounds as an antiseptic.

***Scutellaria heydei* Hk.f (Lamiaceae)**

Aerial parts are dried near the fire and then powdered. An extract

of the powder in water is used against eye trouble. The powder with curds is used as a diuretic.

***Sedum tibeticum* Hk. f. and T. (Crassulariaceae)**

Dry leaves in semi-crushed form are used with curds as diuretic. It is also used to decrease obesity.

***Senecio kraschenninkovii* Schich. (Asteraceae)**

Fresh leaves are crushed and made into a paste. The paste is applied on the forehead to relieve headache and is sometimes used as a poultice for inflamed parts to relieve pain.

***Sisymbrium orientale* L. (Brassicaceae)**

The powdered seeds are rolled into small tablets with butter or milk and used as an appetizer and carminative.

***Soroseris hookeriana* C. B. Clarke (Asteraceae)**

Whole plant (flower) is used in fever, fracture, and hypertension and used as purgative.

***Swertia petiolata* Royal ex. D. Don. (Gentianaceae)**

Decoction of the whole plant in milk is used against headache and bodyache.

***Tanacetum gracile* Hk. f. and T. (Asteraceae)**

Dried leaves and flowers are used against intestinal worms.

***Thalictrum minus* L. (Ranunculaceae)**

Aerial parts are kept in water for several days and boiled. The cooled extract is used as an eye sterilizer, also to cure gout and rheumatism.

***Thymus linearis* Benth. (Lamiaceae)**

Leaf and flower are used as an appetizer, stimulant, and blood purifier, digestive and in the treatment of problems of lungs gum and teeth. Leaves are used as flavour and substitute for tea.

***Waldhemia stoliczkai* (Cl.) Ostenf. (Asteraceae)**

Decoction of shoots and leaves is used in headache, fever and bronchial troubles. The extract is claimed to act as a blood purifier.

***Waldhemia glabra* (Dcne.) Regel (Asteraceae)**

The plant is used for septic wounds.

***Waldhemia tomentosa* (Dcne.) Regel (Asteraceae)**

The achenes are consumed raw in acidity. Crushed fresh leaves are applied as a poultice in arthritis. The plant is used for septic wounds.

Important Plants and their Folk Uses for Dye

The history of natural dyes, dyestuff and dyeing is as old as that of textiles. Man has a strong interest in colours right from the beginning. The art of dyeing has a glorious past and the majority of the dyes can be traced into the prehistory. The art of dyeing was part and parcel of the practices in the Bronze Age in Europe. Plant dyes were the dominant materials used for textile dyeing in Ancient China, Japan, India and many other countries.

If the earliest written record of the use of natural dyes is traced, it can be noted in China dated 2600 BC. Dyeing was prevalent in the Indus Valley period (2500 BC) as evident by the coloured garments of cloth and traces of madder dye in the ruins of the Indus Valley Civilization at Mohenjodaro and Harappa (3500 BC). As per historical evidence, Henna has been used even before 2500 BC, whereas saffron finds reference in the Bible. The first use of the blue dye, woad (*Isatis tinctoria* L.) by the ancient Britons, might have originated in Palestine, where it was found growing wild.

Types of Dyes

Natural dye materials that produce durable and strong colours and do not require the addition of other substances to obtain the desired outcome are called substantive or direct dyes. Sumac (*Rhus* spp.) and walnut (*Juglans* spp.) are native plant examples of direct dyes. Because these species are high in tannic acid, they do not require additional substances to be added to the dye to attach to fibers and form a durable bond. Dyes that require this type of assistance are called adjective or mordant dyes.

Mordants

Mordants are water-soluble chemicals, usually metallic salts, which create a bond between dye and fiber, thus increasing the adherence of various dyes to the item being dyed. The actual colour, one gets from a natural dye depends not only on the source of the dye, but also on the mordant, and the item being dyed. Most mordant recipes also call for the addition of cream of tartar or tartaric acid. Use of this readily

available spice is important because it reduces fiber stiffness that can occur because of mordanting. It can also increase the brightness.

Ethnobotany of some common dye yielding plants is narrated below:

Acacia nilotica (L.) Del. (Fabaceae)

In Nigeria and other sub-Saharan countries, the pods of *A. nilotica* are a source of *khaki*-to-brown dyes if used without a mordant, or gray and black dyes for cotton.

Alnus incana (L.) Moench (Betulaceae)

It is popularly known as gray alder or speckled alder. The inner bark has been used to make yellow dye. Outer bark was employed in order to make a flaming red hair dye. Some tribes mixed gray alder with grindstone dust or black earth to make a black dye. The Zuni people

Table 9. Sources of red coloured dyes

Common name	Botanical name	Part used
Indian mulberry	<i>Morinda tinctoria</i> L.	Wood
Logwood	<i>Hematoxylon campechianum</i> L.	Wood
Madder	<i>Rubia cordifolia</i> L.	Wood
Red kamala	<i>Mallotus philippinensis</i> Muell.	Wood
Safflower	<i>Carthamus tinctorius</i> L.	Flower
Sappan wood	<i>Caesalpinia sappan</i> L.	Wood
Toothed dock	<i>Rumex dentatus</i> L.	Wood

Table 10. Sources of yellow coloured dyes

Common name	Botanical name	Part used
Flame of forest	<i>Butea monosperma</i> (Lam) Taubert	Flower
Golden rod	<i>Solidago grandis</i> DC.	Flower
Saffron	<i>Crocus sativus</i> L.	Flower
Teak	<i>Tectona grandis</i> L.	Leaf

Table 11. Sources of blue coloured dyes

Common name	Botanical name	Part used
Indigo	<i>Indigofera tinctoria</i> L.	Leaf
Pivet	<i>Ligustrum vulgare</i> L.	Fruit
Sunt berry	<i>Acacia nilotica</i> (L.) Del.	Seed pod
Water lily	<i>Nymphaea alba</i> L.	Rhizome
Woad	<i>Isatis tinctoria</i> L.	Leaf

Table 12. Sources of black coloured dyes

Common name	Botanical name	Part used
Alder	<i>Alnus glutinosa</i> (L.) Gaertn.	Bark
Chebolic myrobalan	<i>Terminalia chebula</i> Retz.	Fruit
Custard apple	<i>Annona reticulata</i> L.	Fruit
Rofblamala	<i>Loranthus pentapetalus</i> Roxb.	Leaf

Table 13. Sources of orange coloured dyes

Common name	Botanical name	Part used
Annota	<i>Bixa orellena</i> L.	Seed
Lilly of the valley	<i>Convallaria majalis</i> L.	Leaf
Nettle	<i>Urtica dioica</i> L.	Leaf

utilize the bark of *Alnus incana* (L.) Moench ssp. *tenuifolia* (Nutt.) Breitung to dye deer-skin reddish-brown.

Alnus rubra Bong. (Betulaceae)

It is popularly known as red alder. A russet dye is made from the bark- decoction. It was used by Native Americans to dye fishing nets so as to make them less visible underwater. In the western America, the bark yield red, red-brown, brown, orange, and yellow dyes. These colours have been used to stain various articles like baskets, hides, moccasins, hair, quills, fishnets, canoes, and clothes).

Butea monosperma (Lam) Taubert (Fabaceae)

Flowers of *B. monosperma* yield a red or orange dye which is used as an insecticide and as a colouring agent for fabric. Butrin (Fig 44) is the colouring principle of the dye obtained from the flame of the forest.

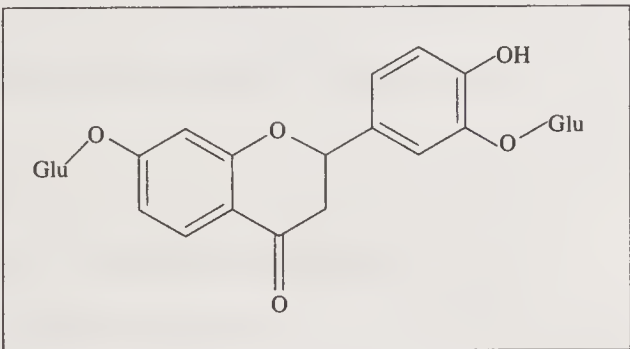


Fig 44. Structure of butrin

Caesalpinia sappan L. (Fabaceae)

Sappan wood was one of the most widely used plant dye for its red colour. It was exported from South East Asia to Europe as dried wood chips. The dye is reported to have anti-inflammatory activity. The pigment finds use in the manufacture of facials which are resistant to light, heat and water and are non-irritating. Brazilin (Fig 45) is the colouring principle of the dye obtained from the flame of the forest.

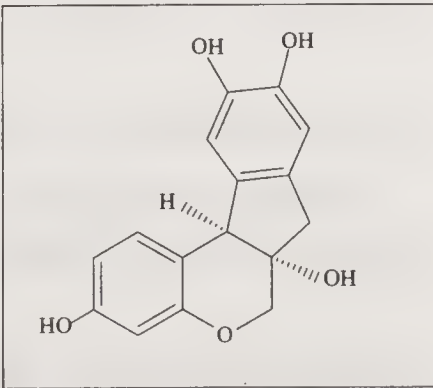


Fig 45. Structure of brazilin

***Caesalpinia coriaria* Willd. (Fabaceae)**

Pods of the plant are used to prepare a blackish or bluish dye for cotton and wool and a black ink, used in the decoration of traditional potteries and gourds in Central America. They are sometimes employed as a mordant for dyeing vegetable fibers with other dyes.

***Carthamus tinctorius* L. (Asteraceae)**

Safflower is a source of red dye known as carthamin. Carthamin (Fig 46) is responsible for the production of water-insoluble red dye and carthamidin for water-soluble yellow colour dye.

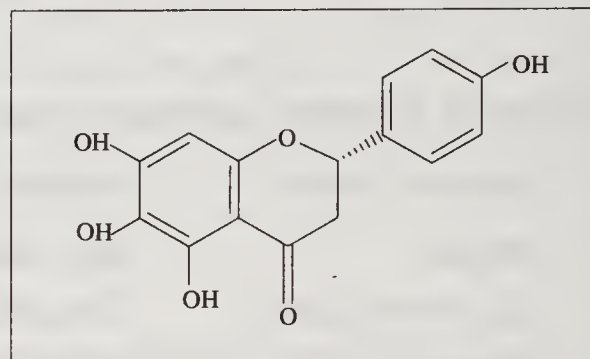


Fig 46. Structure of carthamidin

***Crocus sativus* L. (Iridaceae)**

Saffron has a long history of use as a food dye in making sweets and puddings. The stigmas are the source of a yellow dye that has been in use for centuries to colour clothes. The petals are the source of a blue or green dye.

***Eclipta alba* L. (Asteraceae)**

A black dye obtained from *E. alba* is used for dyeing hair and tattooing. It is a source of flavonoid dye.

***Indigofera tinctoria* L. (Fabaceae)**

Once upon a time, the plant was one of the original sources of indigo dye. Its leaves are used to make hair dye. Indigo has been used for centuries as a textile dye, and hair colourant. It is what, until the advent of chemical dyes gave blue jeans that special navy shade and is still used to dye the beautiful flowing blue robes of the Berber tribes in Northern Africa/Morocco. The Cherokees (a tribe of the early settlement of America) used the plant as a source of blue dye for their clothes.

Dye is obtained from the processing of the plant's leaves. These are soaked in water and fermented in order to convert the glycoside, indicant naturally present in the plant to the blue dye, indigotin (Fig 47).

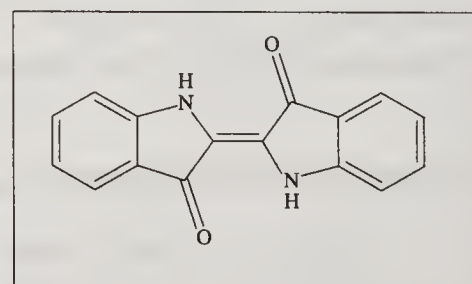


Fig 47. Structure of indigotin

***Isatis tinctoria* L. (Brassicaceae)**

Isatis tinctoria is commonly known as dyer's woad. Woad also stands for blue colored dye obtained from the leaves.

***Juglans cinerea* L. (Juglandaceae)**

Juglans cinerea is commonly known as butternut and is native to the

United States. Native to America utilize the bark of butternut to make a brown dye and black dye out of young roots. By use of an iron mordant, brown dye is changed to a charcoal or gray color.

***Lawsonia inermis* Lam. (Lythraceae)**

Henna is widely used in the cosmetic industry as dyeing agent. The 'lawsone' (Fig 48) is principally responsible for the colourant property of the henna leaves.

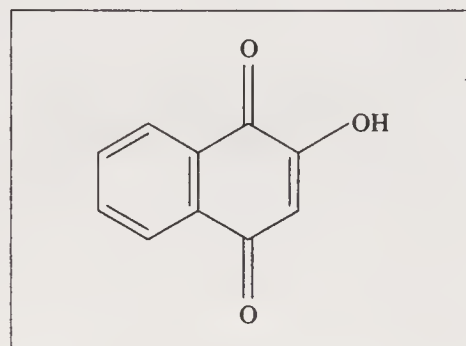


Fig 48. Structure of lawsone

***Pterocarpus santalinus* L.**

The redwood is a source of a natural dye known as santalin (Fig 49), which is used as a colouring agent in pharmaceutical material and method preparations.

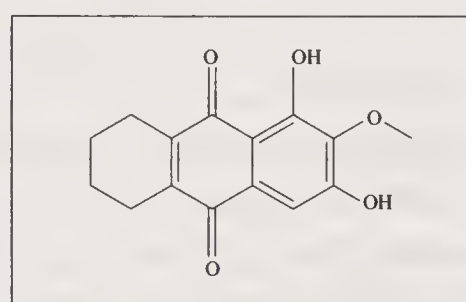


Fig 49. Structure of santalin

***Rhus glabra* L. (Anacardiaceae)**

It is popular as smooth sumac. Its bark is used by Native Americans in making a brown dye. A black dye is prepared from the roots. The leaves are a rich source of tannins and can be employed as direct dye.

***Rumex dentatus* L. (Polygonaceae)**

R. dentatus yields dark green to brown and dark gray dyes.

***Tectona grandis* L. (Verbenaceae)**

Root-bark and the young leaves produce a yellowish-brown or reddish dye, which is used for paper, clothes and matting.

***Terminalia catappa* L. (Combretaceae)**

Fruits and roots provide a black dye for dyeing of cotton, rattan and as ink.

***Terminalia chebula* Retz. (Combretaceae)**

The natural dye extracted from *T. chebula* is known as kareel. It is green yellow in colour and used for textiles.

***Urtica dioica* L. (Urticaceae)**

A permanent green dye is obtained from a decoction prepared out of the leaves and stems. The root boiled with alum yields a yellow dye.

***Woodfordia fruticosa* Kurz. (Lythraceae)**

Flowers yield a red dye which is used to colour fabric.



5

Symbiotic Relationships including Mythology

Introduction

Plants have a significant role in mythologies and religions of various countries across the world. Plants have deep and sacred meanings throughout the ages. World tree represents the most ancient cross-cultural symbolic representation of the universe's construction. Other examples of plants featured in mythology are Yggdrasil and the modern tradition of the Christmas tree (*Araucaria columnaris*) in Germanic mythology, the Tree of Knowledge of Judaism and Christianity, and the Bodhi tree in Buddhism.

In folk religion and folklore, trees are often said to be the homes of tree spirits. Historical Druidism as well as Germanic paganism appears to have involved cultic practice in sacred groves. The term *Druid* itself, possibly derives from the Celtic word for oak. *Ficus religiosa* plays an important role in Indian mythology. The graceful birch tree (*Betula* spp.) has always held a special place in the people's hearts and minds, who perceived her as the youthful Goddess of love and light.

Some Plants in Indian Mythology

In Indian mythology a number of plants have been given sacred value and worshipped by different cultures. Some important plants of sacred value have been discussed here.

Ashoka: The *ashoka* tree is one of the most sacred and legendary trees of India, and one of the most fascinating flowers in the Indian range of flower essences. The beautiful, perfumed flowers of the ashoka tree are used in temple decoration. Prized for its beautiful foliage and flowers, the ashoka tree has much religious significance. This tree is revered by the Hindus, Buddhists and Jains. It is said that Lord Buddha was born under this tree in Lumbini. Some say that Lord Mahavira renounced the world under the ashoka tree in Vaishali. The Hindus worship this tree because it is dedicated to *Kama Deva* (God of Love). The Ashoka tree gets a mention in the epic *Ramayana* as the *Ashoka Vatika* (garden of Ashoka trees) where Hanuman first meets Sita. Literally meaning the *sorrowless tree*, it is believed that drinking the water in which the flowers have been washed is widely considered a protection against grief among the Indians.

Banyan: Banyan tree symbolizes the *Trimurti*-Lord Vishnu, Lord Shiva and Lord Brahma. The tree also symbolizes *life* and *fertility* in many Hindu cultures. That is the reason, banyan tree is worshiped by those who are childless and this tree should never be cut. The tree can grow into a giant tree covering several hectares. *The Great Banyan* in the Indian Botanic Garden, Howrah, is considered to be the largest tree in the world. *Lord Dakshinamurthy*, who is worshiped as the “ultimate guru”, is usually depicted beneath a banyan tree. He symbolizes Lord Shiva and is seen as the destroyer of ignorance and embodiment of knowledge.

Bael: In India, bael tree is considered to be very sacred because it is associated with Lord Shiva. It is said that Lord Shiva is pleased by the offerings of leaves bael tree, also known as *bilva* or *bel* tree. Thus, the Brahmanas worshiped Lord Shiva for a period of one fortnight by offering bael leaves and that way satisfied Lord Shiva greatly. Fruits, flowers and leaves of the tree are all sacred to Shiva. Planting these trees around the home or temple is sanctifying and is equivalent to worshipping a *Linga* with bilva leaves and water. The trifoliate leaf of bael tree is believed to symbolize the three functions of the Lord-the *creation, preservation and destruction* as well as *his three eyes*. The offering of the leaves is a compulsory ritual while worshipping Lord Shiva all over India. The bael tree is also sacred to the Jains. It is said that the 23rd Tirthankara, Bhagwan Parasnathji attained *Nirvana* enlightenment under a bael tree. Besides religious significance, almost all parts of the tree have medicinal qualities. Bael is an ingredient in many Ayurvedic and Siddha formulations.

Bamboo: The common names of Lord Krishna-Venugopal, Bansilal, Murali and Muralidhar reflect His association with *Bansuri* or *Venu*, His constant companion. *Bansuri* is actually a flute made of bamboo. That is the reason; bamboo is revered in India because it is associated with Lord Krishna.

Banana: Though banana is not a tree, it is considered a tree because of its structure and size. It is a very sacred tree and all parts of the tree are used for some purpose or the other. For example, the trunk of banana is used to erect welcoming gates. The leaves are used to make the ceremonial pavilion. In some pooja, the leaves are used to serve “*prashad*”. Just as the leaves of bael tree are customarily offered to Lord Shiva, it is believed that offering of the leaves of banana pleases Lord Ganesha. Banana as a fruit is offered to Lord Vishnu and Lakshmi.

In fact, the eleventh day of the bright half of Pausa (December-January) is considered to be very auspicious to offer banana to Lord Vishnu and Goddess Lakshmi and sixth day of the bright fortnight of Kartika (October-November) is considered auspicious to offer banana to the Sun god. In some regions, banana tree is worshipped while

performing *Kadali Vrata* or fast. According to tradition, during *Vaisakha*, *Magha* or *Kartika shukla chaturdashi*, a banana tree is planted and nurtured till it bears fruit. It is said that worshiping the tree with flowers, fruit, etc. helps in the welfare of one's family.

Bhang: To all Hindus, *bhang* tree is a very holy tree. There are many beliefs associated with *bhang* tree. It is believed that a guardian lives in *bhang* leaf. To see in a dream the plant or water or leaves of *bhang* is considered lucky as it brings wealth and prosperity into the dreamer's power. To meet someone carrying *bhang* is a sure sign of success. *Bhang* is a popular drink made of the leaves and flowers of *bhang* tree are considered to be a "*prashad*". It is must for every devotee to have *bhang* on *Mahashivratri*. It is also said that nothing good can come to the man who treads underfoot the holy *bhang* leaf. A longing for *bhang* is a sign of happiness. Since ancient times, yogis take deep draughts of *bhang* so that they can center their thoughts on the Eternal without any disturbance because *bhang* has that intoxicating power in it.

In fact, the students of ancient scriptures at Benares were given *bhang* before they sit to study. *Bhang* has also many medicinal virtues. It is also believed that no god or man is as good as the religious drinker of *bhang*. It is also said that to restrict the use of such a holy and gracious herb as the hemp or *bhang* would cause widespread suffering and annoyance.

Coconut: In Sanskrit, the name for the coconut palm *Kalpa vriksha*, which means *the tree which provides all the necessities of life or wish-fulfilling tree*. The coconut tree is given a special place in most Hindu households and great care is taken to the nature the tree. In the southern part of India, it is a must for every household to plant coconut trees. There is a popular saying, *Water the plant for five years, and reap coconuts for life*. The coconut is used for all religious purposes. In fact, it represents the main *sthapana* of any *pooja*.

The whole pot filled with water, mango leaves and coconut, also known as *Purnakumbha* is a symbol of Goddess *Lakshmi* or Fortune and the coconut represents divine consciousness. To break a coconut in the beginning of any event is considered to be very auspicious. Coconuts are offered in temples to worship Gods and Goddesses. The fruit is also believed to represent Lord Shiva and the three black marks on the coconut shell, symbolize his eyes.

Lotus: It is always considered as an evocative symbol of beauty, purity and divinity and a highly revered flower by all Hindus. In Hinduism many of the deities are pictured sitting upon a lotus or holding a lotus flower. Rising up pure and unsullied from the depths of the muddy swamp, lotus represents the manifestation of God. Pure white lotus flower is the only plant to fruit and flower simultaneously. The flower is a symbol of Goddess *Lakshmi*. One of the incarnations of the

Mother-Goddess or Devi and wife of the Hindu God Vishnu, Lakshmi is the Goddess of fortune and prosperity as well as the epitome of feminine beauty.

According to Hindu mythology she was born radiant and fully grown from the churning of the sea. Lakshmi is always portrayed as sitting on a lotus flower which is her traditional symbol. That is why this flower held in high esteem. Lotus flower has also symbolized spiritual enlightenment. It is said that lotus in Eastern Culture has a similar symbolism to the *Rose in Christianity*.

Mango: It is another sacred tree of the Hindus. The significance finds mentions in the *Ramayana*, *Mahabharata* and *Puranas* tree's Mango as a fruit is a symbol of love and fertility. The leaf of the tree is used during most religious and social ceremonies of the Hindus. A *Purnakumbha* is a pot filled with water and topped with fresh mango leaves and a coconut and considered to be the *staphna* of the *pooja*. The pot symbolizes Mother Earth, water is the life giver, coconut the divine consciousness and the mango leaves symbolize life. The whole *Purnakumbha* symbolizes Goddess *Lakshmi* and good fortune. On various auspicious occasions, mango leaves are used to adorn entrances at home to signify good fortune. Mango blossoms are used on the *Basant Panchami* day in the worship of Goddess *Saraswasti*. The tree is also sacred to the Buddhists because it is believed that Lord Buddha performed during his lifetime the instantaneous creation of a large mango tree from the seed at a place called Shravasti.

Neem: It is said that on the first day of Chaitra, after Amavasya, it is very essential to worship *neem* and eat its leaves, mixed with pepper and sugar, as a safeguard from fever. The tree besides having various medicinal benefits, is highly revered among the Hindus because it is a manifestation of Goddess *Durga* or *Maa Kali*. That is why the tree is sometimes referred to as *Neemari Devi*. It is worshiped very intensely. Tamil ladies, while worshiping *Maa Kali* dress in red, carry branches of *neem*, and dance in public places swishing the branches as an act of exorcism and to purify the world. The multi-headed occult Goddess Yellamma (a highly revered Goddess in south India) sometimes assumes the appearance of a young *neem* tree. Young maidens worship this Goddess by cladding themselves all over in *neem* branches. In Bengal, *neem* is considered to be the tree which is the abode of *Sitala* (the great Pox-mother who can cause or cure disease). The customary treatment of pox is, therefore, to rub the body with *neem* leaves while making prayers to *Sitala*. It is also said that the smoke of burning *neem* protects both the living and the dead from evil spirits.

Peepal: Peepal tree also known as *Ashvattha* in Sanskrit is a very large tree and the first-known depicted tree in India. A seal discovered at Mohenjodaro, one of the cities of the Indus Valley Civilization depicts

peepal being worshiped. According to the *Brahma Purana* and the *Padma Purana*, when the demons defeated the Gods, Lord *Vishnu* hid himself in the peepal tree and that is why it is believed that the peepal tree is a symbol of *Vishnu* and is worshiped since long. There is another belief that the tree represents the *Trimurti*-the roots being *Brahma*, the trunk *Vishnu* and the leaves *Shiva*. Some say that Lord *Krishna* is believed to have died under this tree, after which the present *Kal Yuga* started. According to another belief, Goddess *Lakshmi* also inhabited the tree, especially on Saturday and hence it is considered auspicious to worship it. In fact, women worship the tree to bless them with a son tying red thread or red cloth around its trunk or on its branches. According to the *Skanda Purana*, to cut down a peepal tree is considered a sin. Even the Buddha is believed to have attained enlightenment under tree and Peepal is also sacred to Buddhist. Hence it is also called the *Bodhi tree* or *tree of enlightenment*.

Red Sandalwood: Besides being used in the fragrance industry, fine woodworking and aromatherapy, sandalwood is commonly used for incense and religious ceremonies. Red sandalwood is considered to be a very sacred tree and is like a sage among many people. It is said that all other trees are considered ordinary trees and are like ignorant men in front of a red sandalwood. Popularly known as *chandana*, sandalwood has an extraordinary fragrance. Sandalwood paste is used in all religious rituals. The paste is smeared on the foreheads of devotees of *Vishnu* and *Shiva* and it is said that the sandalwood paste is meant to cool and protect the *Agna chakra* present between the eyebrows. In India, the death pyre is made using sandalwood branches for centuries. According to legend, Lord *Ganesha* was created by Goddess *Parvati* out of sandalwood paste that she used for her bath and breathed life into the figure.

Tulsi: *Tulsi* is always associated with purity and highly revered and used for all religious purposes among the Hindus. It is considered very auspicious to have a *tulsi* plant in the front courtyard of many Hindu households. *Tulsi* beads can always be seen around the necks of serious yogis and mystics in India, worn to purifying the mind, emotions and body. Dispelling the unwanted influences of others, gross and subtle, is one of the many benefits bestowed by *tulsi* plant and hence worshipped by all. *Tulsi* plants are also prized in *Ayurveda*, where they are considered an integral part of that sophisticated healing system. In practically every temple in India, no *pooja* can be started without few *tulsi* leaves. There is always a special place reserved for this sacred plant. The qualities and amazing powers of this plant are found throughout the oldest writings on the earth, the Sanskrit Vedas of ancient India, where it is stated that simply touching the wood is purifying at many levels.

Various forms of plant life also appear in folklore, culture and fiction, often relating to immortality or fertility. These often hold cultural and religious significance to the people for whom they appear.

The plant, with its branches reaching up into the sky, and roots deep into the earth, can be seen to dwell in three worlds - a link between heaven, the earth, and the underworld, uniting above and below. It is also both a feminine symbol, bearing sustenance; and a masculine, phallic symbol - another union.

In literature, a mythology was notably developed by J. R. R. Tolkien, his *Two Trees of Valinor* playing a central role in his mythopoeic cosmogony. Tolkien's (1964) *Tree and Leaf* combines the allegorical tale *Leaf by Niggle* and his essay *On Fairy-Stories*. William Butler Yeats describes a holy tree in his poem *The Two Trees* (1893).

Symbiosis

The term symbiosis refers to a partnership of two dissimilar organisms (viz., two dissimilar plants or a plant and an animal) in which both are mutually benefited. It is also known as mutualism. Each partner in a symbiotic association is called symbiont. A number of cases of symbiotic relationships are known to exist in the plant kingdom. The most common example of symbiosis is furnished by mycorrhizae and in addition by lichens, nodulated roots of legumes and non-legumes, leaf nodules, and coralloid roots.

Symbiotic Relationships in Rosaceae

Out of 122 genera in the Rosaceae, only 4 are capable of fixing nitrogen. *Dryas*, *Purshia*, *Cowania*, *Chamaebatia* members of sub-family Dryadoideae are characterized by having a symbiotic relationship with nitrogen-fixing bacteria (*Frankia* spp) that infect their roots. Nodules like organs have been reported in *Rubus ellipticus* Sm. (golden Himalayan raspberry) in Indonesia. *Dryas drummondii* Richardson ex Hook. (Drummond's mountain-avens), native to the mountains of North America, accumulates 335 kg of nitrogen per hectare.

Chamaebatia foliosa Benth. has nodular structures on the roots that fix atmospheric nitrogen. The morphology of these nodules is similar to on-legumes. An excavated *Cercocarpus ledifolius* Nutt. (Mountain mahogany) shrub in a *Pinus flexilis* stand in the San Bernardino Mountains of California and was found to be nodulated and these nodules were found to be capable of fixing nitrogen. Other known nitrogen-fixing shrubs are frequent associates of *Pinus flexilis* in extreme sites.

Symbiotic Relationships in Malvaceae

Mycorrhizal symbiosis increases growth, reproduction and recruitment

of *Abutilon theophrasti* Medic. in the field. In addition, the seeds produced by mycorrhizal plants were significantly larger and contained significantly more phosphorus than seeds from non-mycorrhizal plants.

Symbiotic Relationships in Fabaceae

Symbiotic nitrogen fixation: Symbiotic nitrogen fixers in leguminous plants inhabit small, knob like protuberances called "nodules" on the roots of the plants. These root nodules vary considerably in their shape and size. They may be spherical, elongated, flat and grooved or may have finger like projections. Their size varies from pinhead to 1 cm in diameter.

The nodule bacteria include many species of the genus *Rhizobium*. The various species of *Rhizobium* inhabit different leguminous plants. They show a degree of specificity as regards their host plants. These bacteria are unable to fix nitrogen in the absence of specific hosts. The lectins are supposed to be the chemical substances involved as recognition substances between the two symbionts.

Myrmecophytes or ant plants: The plants which live in a symbiotic relationship with ants are known as myrmecophytes. *Acacia hindsii* Benth, native to tropical dry forests in Central America, is a typical example of a myrmecophyte. The ants of the genus *Pseudomyrmex* are inhabitants of the plant. The ants are dependent completely on *A. hindsii* for nectar and the food bodies surplus in fats and proteins. *A. hindsii* provides shelter (domatia) in the hollow spaces of the swollen thorns. The ants on the other hand, protect *A. hindsii* against attack of herbivores and competition from other plants.

Acacia sphaerocephala Schltdl. and Cham., *Acacia cornigera* (L.), and *Acacia collinsii* Saff. are popularly known as bull-thorn acacias. They are distributed in Central America. The spiny stipules of these plants are big, hollow as well as swollen. The stipules provide shelter for several species of ants (*Pseudomyrmex*). These ants derive nutrition from extrafloral nectaries present on the leaf stalks. They also feed on fat rich food bodies present at the tips of the leaflets (Beltisan bodies). The ants reciprocally provide protection to the plants against herbivores. These ants play key role in removing competing plants around acacias by killing them.

Acacia drepanolobium Harms ex Sjöstedt, native to East Africa is commonly known as whistling thorn acacia. This plant provides shelter to ants in swollen stipules similar to those found in *A. sphaerocephala*, *A. cornigera* and *A. collinsii*. Ants (*Crematogaster mimosa*) feed on extrafloral nectarines. In turn, the ants provide shelter to the plant by attacking large mammalian herbivores and stem-boring beetles.

Bagheera kiplingi is an herbivore spider distributed in Central America and Mexico. It feeds on nubs at the tips of the acacia leaves, known as Beltian bodies. These nubs are produced by the acacia as part of a symbiotic relationship with certain species of ant, which also eat them.

Let us cite example of *Acacia tortilis* Heyne. This is a perfect example of an incredible symbiosis with ants. The plant is found in Kenya and commonly known as whistling thorn. This plant has beautifully adapted to the semi arid environment. Nature has provided *A. tortilis* with bulbous thorns occupied by very aggressive stinging ants (of the genus *Crematogaster*) that have a protective effect from herbivores. The ants hollow out the soft green thorns for living quarters. Thorn giraffes and other herbivores normally eat thorny acacia foliage, but leave the whistling thorn alone.

Humboldtia brunonis Wall is an understorey tree, endemic to the lower elevation moist evergreen forests in the Western Ghats. All individuals of *H. brunonis* bear extrafloral nectaries on the leaves, and bracts of flowers. The extrafloral nectar is rich in sugars, and hence very attractive to ants.

Symbiotic Relationships in Polygonaceae

Triplaris americana L. has important place in the urban landscape industry. It is used as a medicinal plant for the treatment of various diseases. *Aethalion reticulatum* is a species of leaf-hopper, which feeds on the sap of *T. americana*, especially fruit, which can hinder plant and fruit growth. *T. americana* may be an important source of food and shelter, as well as a location for breeding of this species so that it may be considered a host plant for *A. reticulatum*.

Polygonum viviparum L. has been shown to form an ectomycorrhizal root symbiosis with fungi. A mutualistic relationship is postulated between *Polygonum cuspidatum* Siebold & Zucc. and *Myrmica rubra* (European fire ant). *Coccoloba cereifera* P. Brown is well known for its symbiotic properties. A carpenter ant sucks nectar from the leaf of a *C. cereifera*, a small shrub endemic to Cipó National Park in southeast Brazil. The ant gets its supper and the plant gets a break from the herbivores that nibble its leaves when the ant isn't around.

Symbiotic Relationships in Moraceae

There are other trees in the Central American rain forest with symbiotic ants. Some of the most interesting are species of *Cecropia* of Moraceae, including *C. peltata* L. (Snake wood) and *C. obtusifolia* Bertol (trumpet tree). In Costa Rica, the reason three-toed sloths are often found in cecropia trees is that they are easier to spot in the open, leafless

branches compared with other trees. The pithy limbs and stem internodes are usually hollow and occupied by colonies of Azteca ants, a Neotropical genus of aggressive, biting ants. The ants commonly feed on the nutritious honeydew secretions of mealy bugs, but will also forage for other insect prey. During the dry season in the Guanacaste Province of Costa Rica, leafless *Cecropia* trees maintain a crop of tiny leaves bearing minute food bodies for the colonies of Azteca ants.

Symbiotic Relationships in Apiaceae

Members of Apiaceae (Umbelliferae) have unique relationships with insects. Due to large umbels of plants of this family, larger insects land on and pollinate them. Further, these large insects consume the small, herbivorous insects feeding on the plant. They also attract certain insects using nectar from their large stylopodium. Some even produce strong scents that hide the pheromones of some insects, deterring them from the plants. The ability to deter harmful insects while attracting helpful ones can benefit other plants around the members of Apiaceae, and so they are often used as companion plants to other crops.

Certain plants of Apiaceae support some of the swallowtail butterfly species. *Papilio polyxenes* prefers celery species, while eastern black swallowtails and anise swallowtails prefer parsley and carrot varieties. The butterflies lay their eggs on the plants of Apiaceae, and the larva use them as host plants while they mature. They use species in the genera of *Cicuta*, *Carum*, *Apium* (celery), and many more. They are able to live on and even consume the poisonous hemlock species, as they have the remarkable ability to detoxify the poison in the plant. Interactions between the invasive weed *Heracleum mantegazzianum* Somm. et Lev. (native to the western Caucasus) and associated insects have been reported.

Symbiotic Relationships in Asteraceae

Cosmos naturally occurs in tropical America. The flowers are visited by bumble bees. Most coloured flowers are meant to attract insects for pollination. Insect-aided pollination is usually a mutualistic symbiotic relationship. The plants produce nectar and excess pollen to attract insects and advertise these products with their colourful flowers. The insects obtain pollen or nectar to eat them or to feed to their young and, in return, the plants obtain a specialized carrier for their pollen. The sperm in the pollen grains fertilizes the plants' ova and increases their genetic diversity.

Symbiotic Relationships in Rubiaceae

Several succulent caudiciform genera, *Anthorhizza*, *Hydnophytum*,

Myrmecodia, *Myrmephytum*, *Phylhydrax* and *Squamellaria* have commensal relationships with ants which nest in cavities in tubers or stems. *Myrmecodia* is an interesting genus of 26 species of epiphytic ant plants native to South-East Asia, where they grow on the branches of rainforest trees. The plants develop a spiny grayish caudex to store water and food. These plants form symbiotic relationships with mycorrhizal fungi and ants, which allows them to obtain sufficient nutrients, despite a very limited root system and minimal substrate. The caudex develops a labyrinth of internal chambers opening to the surface and inviting occupation by ants. *Pavetta zinumermanniana* is known for symbiotic biological nitrogen fixation through leaf nodules.

Symbiotic Relationships in Ebenaceae

Diospyros mespiliformis Hochst. ex A.DC. (African ebony) has a fantastic mutualism and symbiotic network with many living organisms, from human beings to small insects. This tree is involved in a unique ecosystem. Different insects such as bees and wasps play a role in pollinating the flowers. Seeds are dispersed either through a wash-off by rain or in the droppings of animals that feed on the fruits. Termites often build their nests around the tree and feed on the roots. The tree benefits from moisture and aeration as a result of termites burrowing in the soil under the tree. Snakes like to reside close to or around the tree as they prey on the rodents and certain birds that feed on the fruits.

Symbiotic Relationships in Betulaceae

Alders are among the few plants that form symbiotic relationships with nitrogen-fixing bacteria. In alders, filamentous bacteria known as actinomycetes form nodules on the roots. The nitrogen compounds produced by the actinomycetes are in a form directly usable by the host alder plant. In addition, some of the nitrogen compounds are leached from the nodules or released when nodule-bearing roots die. These compounds accumulate in the soil where they remain available for use by other plants of later successional stages that cannot produce their own nitrogenous compounds.

Symbiotic Relationships in Elaeagnaceae

Elaeagnus x ebbingei (Silverberry) is nitrogen fixing, meaning its roots have a symbiotic relationship with certain soil bacteria which form nodules on the roots of the plant and fix atmospheric nitrogen. Some of this nitrogen is used by the plant itself for its own growth; however, some of the nitrogen is also available for plants growing nearby. Thus, planting *E. ebbingei* near other food crops can improve growth and increase productivity.

Hippophae rhamnoides L. (Common sea-buckthorn) is associated with *Frankia* bacteria to fix nitrogen from the atmosphere.

Symbiotic Relationships in Casuarinaceae

Casuarina equisetifolia Forst. (Australian pine) fixes atmospheric nitrogen through a symbiotic relationship with *Frankia*, a soil bacterium of the actinobacteria group. The roots of *C. equisetifolia* produce root nodules where the bacteria fix atmospheric nitrogen, which is an essential nutrient for all plant metabolic activities. *C. equisetifolia* growing in the dunes accumulates about 58 kg of nitrogen per hectare annually.

Casuarina cunninghamiana Miq. (The river she-oak) also has a symbiotic relationship with the nitrogen-fixing actinomycete *Frankia*. This symbiosis is instrumental in providing nitrogen to *C. cunninghamiana* and in growth on low fertility soils. However, *C. cunninghamiana* introduced into exotic localities are commonly unnodulated due to a lack of native *Frankia*.

Symbiotic Relationships in Asclepiadaceae

Asclepiadaceae or the milkweed family includes two genera that feature ant-housing species. *Hoya imbricata* Decne is a shingle plant, meaning it develops imbricate leaves that allow it to live perched flat against tree trunks. *H. imbricata* is variegated and quite attractive, but difficult to propagate as it requires constant humidity. Ants live under its tree-hugging leaves and possibly aid the plant, though research in this area is still very scarce.

Dischidia pectinoides Paer (Ant plant) is an epiphytic plant which has a symbiotic relationship with ants. It grows small hollow "pods" that have roots inside. In nature, ants use these pods to live in, bringing with them food debris which in turn feeds the plant nourishment.

Symbiotic Relationships in Euphorbiaceae

Macaranga taxon includes species that have a symbiotic relationship with ants. *Macaranga bancana* (The common mahang) has developed an obligatory relationship with the heart gaster ants (*Crematogaster* sp.), so named because of the heart shaped gaster or abdomen. The queen ant enters the young plant by chewing her way through a tender shoot. She then seals herself from inside and lays her eggs. She will have to care for the larvae until they turn into worker ants. These workers will then look after subsequent batches of eggs that the queen will lay.

The plant provides food for the ants in the form of the many small, white, starchy bodies found on the undersurface of the stipules.

These stipules are the conspicuous downturned, brownish red structures found along the stem on both sides of the leaf stalk.

In return for providing food and lodging to these ants, the plant benefits from the protection these ants provide against herbivores, insects and pathogenic fungi. Whenever insects or other large organisms land for the plant, the resulting vibrations will alert the ants. They will then swarm out from their galleries inside the stems from the way of the tiny holes that are found on the surface of the stems. It has been reported that these ants will then raise their rear portion, the gaster, in agitation and squirt formic acid onto the intruders.

The ants also bite off vines that come into contact with the host tree, thus ensuring that the tree does not get strangled by surrounding vines.

Symbiotic Relationships in Lauraceae

Some members of Lauraceae developed a symbiotic relationship with ants, who defend and protect the tree. Species of the genus *Pleurothyrium* in particular, have a symbiotic relationship with ants that protect and defend the tree. Some *Ocotea* species are also used as nesting sites by ants, which may live in leaf pockets or in hollowed-out stems.

Symbiotic Relationships in Liliaceae

The yucca (*Yucca* spp.) and the yucca moth (*Tegeticula* spp.) share a mutually beneficial relationship, each dependent on the other for survival. The female yucca moth is the sole pollinator of the yucca, and the yucca is the only host plant of the yucca moth. In fact, the yucca and yucca moth share a symbiotic relationship that is so specialized, each yucca species is pollinated by only one type of yucca moth. Flowers of chaparral yucca (*Hesperoyucca whipplei* (Torr.) Trel.) harbor a male and a female yucca moth (*Tegeticula maculata*).

Symbiotic Relationships in Poaceae

Grass leaves or blades do their growing at their bases, not their tips. This allows animals to graze them and lawn mowers to cut the tips of the leaves without killing the plant. The large grazing animals that evolved during the Cenozoic period have a symbiotic relationship with the grass family and contributed to their spread across the face of the Earth.

Symbiotic Relationships in Gunneraceae

Gunnera is unique in being the only angiosperm genus that forms symbiotic associations with the N₂-fixing cyanobacterium (*Nostoc punctiforme* L.).

Symbiotic Relationships in Cycadaceae

Cycads also have specialised roots, termed collaroid roots, which form into coral like structures. Collaroid roots are also known as corallorhiza. Coralloid roots contain blue green algae (*Anabaena cycadacearum* and *Nostoc* spp.) that form a symbiotic relationship with the plant, fixing nitrogen for it. Cycad species also form symbiotic relationships with mycorrhiza.

Symbiotic Relationships in Pinaceae

In this case, the primary root persists and forms a typical elongated straight tap root. Tip of the root has a protective root cap. The root hairs are not very well developed. The root system which develop the new young branches remain short and undergo frequent forking so that clusters of small rootlets are formed. These are known as mycorrhizal roots. Under the microscope they are seen to be covered with a close weft of colourless hyphae. However, the exact relationship between the hyphae and the root system is still a debatable issue.



6

Ethnobotany and Bioprospecting

What is Bioprospecting?

Bioprospecting is the search for value in the biological world as an incredibly ancient practice. In a general way, any time that we search for food or other biological value in our environment, we are bioprospecting. When ethnobotanists study traditional human interactions with plants, they are in fact, studying the results of bioprospecting, the bioprospectees (plants) and the bioprospectors (knowledge holders).

In fact, bioprospecting has been going on for centuries, but only within the past 20 years has this activity gained prominence due to technological advances in pharmaceutical, biotechnological and agricultural sectors.

Bioprospecting is better defined as field explorations to seek and document indigenous/traditional medical knowledge (IMK/TMK), and/or the biodiversity with which the IMK/TMK is attached, and its conversion into a commercialized product is known as bioprospecting or biodiversity prospecting.

Secretariat of the Convention on Biological Diversity, 2001

The 2nd meeting of the Conference of the Parties emphasized in the preparation of a periodic report on biological diversity: the Global Biodiversity Outlook (GBO). As per suggestion, the aim of the GBO was to provide a summary of the status of biological diversity and an overview of the steps being taken by the global community to ensure conservation and sustainable use of the biodiversity. Further, it should monitor that the benefits arising out from the use of genetic resources are shared equitably.

International Society of Ethnobiology Constitution, 2005

The International Society of Ethnobiology (ISE) is a global, collaborative network of individuals and organizations. It works to preserve vital links between human societies and the natural world. It plays a key role in promotion of biological, cultural, and linguistic diversity.

The Belem Declaration

In the year 1988, the 1st International Congress of Ethnobiology was assembled in Belém (Brazil). People involved in indigenous and traditional practices from various countries had met with scientists and environmentalists in order to formulate a common strategy to stop the alarming decrease in the biological and cultural diversity of earth.

Among the major concerns was the unique ways in which indigenous and traditional people perceive, use, and manage their natural resources. Further development of programmes in order to preserve and strengthen the traditional knowledge of indigenous communities was also part of active discussions.

The Congress of Ethnobiology produced The Declaration of Belém, which outlined the role and duty of the scientists and environmentalists in addressing the requirements of the local communities and acknowledged the active role of indigenous people in various aspects of global planning.

The United Nations Convention on Biodiversity

The Convention on Biological Diversity was inspired by the world community's growing commitment to sustainable development. It represents a dramatic step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources.

National Cooperative Drug Discovery Group (NCDDG)

The purpose of the National Cooperative Drug Discovery/Development Group (NCDDG) Programme is to create multidisciplinary research groups or partnerships for the discovery of pharmacological agents to treat and to study mental illness or drug or alcohol addiction. The objectives of this programme are to: accelerate innovative drug discovery; develop pharmacological tools for basic and clinical research on mental disorders, or drug or alcohol addiction; develop and validate models for evaluating novel therapeutics for mental disorders; and support early phase human clinical testing to rapidly assess the safety and efficacy of promising drug candidates and new indications for IND-ready agents for the treatment of mental disorders or alcohol addiction.

The National Institute of Mental Health (NIMH), the National Institute on Drug Abuse (NIDA), and the National Institute on Alcohol Abuse and Alcoholism (NIAAA) encourage applications to advance the discovery, preclinical development, and proof of concept testing of new, rationally-based candidate agents to treat mental disorders or drug or alcohol addiction, and to develop novel ligands as tools to further

characterize existing or to validate new drug targets. Partnerships between academia and industry are strongly encouraged.

The International Cooperative Biodiversity Groups (ICBG)

A U.S. Government funded effort to promote equitable sharing of biodiversity benefits in the context of integrated research and development toward drug discovery, biodiversity conservation and economic development.

Wildlife Protection by Tribals in India

“The tribal life of India has a long history. The British adopted two policies for them. One was for the removal of certain evil customs, which were prevalent in the society, like *sati*, child marriage, etc., and the other was the policy of non-interference in the recognition of their customary laws about marriage, adoption, succession, etc.

There are many laws for the Scheduled Tribes and at the same time they have their own customary or traditional code of conduct too. The legislative provisions are of two types, one for their welfare and the other that puts restrictions on their conduct.

There are many laws to protect the environment. Some of them are; Wild Life (Protection) Act, 1972, Indian Forest Act, 1927, etc. These acts protect the wild life by declaring some areas as protected areas, reserved forests, protected forests, etc. These acts also affect the tribal laws, which are made for the welfare of the tribesmen.

The regulations of many protected areas in the world strictly prohibit hunting, gathering of plant resources or other productive activities within park or reserve borders. This policy applies to all local people; even those who have traditionally had access to the area and possibly practised sustainable ways of harvesting natural products from the wild lands. They are forced to continue their activities in buffer areas around the park, which may lack some resources and where they may face competition from enterprises which may be ecologically destructive, such as certain types of logging and agriculture.

The Forest Rights Act, a law recognizing the rights of forest communities, has come into force, with the Ministry of Union Tribal Affairs issuing a formal notification to this effect on January 1, 2008.

The Scheduled Tribes and Other Traditional Forest-Dwellers (Recognition of Forest Rights) Act, 2006, was notified after more than a year of political interventions, bureaucratic twists and hectic lobbying by activists representing tribal and wildlife interest groups.

The main beneficiaries of the Act are scheduled tribes (STs) and other traditional forest-dwellers living in and depending on forests for

their livelihood for three generations — 75 years prior to December 13, 2005.

Essentially, the Act aims to provide a framework to record the rights of forest-dwellers, allowing them to cultivate forest land to the extent under occupation, subject to a ceiling of four hectares, the right to collect, use and dispose of minor forest produce, and rights inside forests that are traditional and customary, like grazing and maintaining homesteads. The act renders the Forest Conservation Act, 1980, the Wildlife Protection Act, 1972, and the Indian Forest Act, virtually invalid.

The Act also makes it mandatory for right holders to ensure sustainable use, conserve bio-diversity and maintain ecological balance, thereby strengthening the conservation regime of forests across the country.



7

Paleoethnobotany

What is Paleoethnobotany?

Paleoethnobotany is also known as archaeobotany. It is defined as a branch of archaeology which studies how people in the past used plants. Plant remains found in archaeological sites can tell us a great deal about the people who once lived there. Paleoethnobotanists study the remains of ancient plants (mainly seeds) preserved in archaeological contexts which can be retrieved by flotation.

Retrieving Plant Material by Flotation

The entire soil sample is slowly poured into the barrel on top of the mesh and gently agitated with hands to break up any clumps and wash the material through the mesh. The water is allowed to flow steadily through the weir and into the sieves, taking any floating or suspended material with it. The water remains running until no further carbonized material floats to the surface.

Plant Remains

- Macrobotanicals
 - Plant remains that can be seen with naked eye
 - Nuts, seeds, charcoal, fruit pits
- Microbotanicals
 - Plant remains that can only be observed microscopically
 - Pollen, phytoliths, fossil cuticles, diatoms

Subsistence: Wild Plants

Like people of today, ancient people needed to eat a balanced diet with protein, carbohydrates, fats, vitamins, and minerals. For 99.5% of our human history, we subsisted on a diet of hunted meat and gathered wild nuts, plants and fruit. Plants such as sumpweed, sunflower, and squash are higher in kilocalories (535-560), and hickory is higher still (673).

Non-Food Uses

Plant oils were not only incorporated into food, but were also used as a base for body paints and for dressing people's hair. Also used for cordage, clothing, housing, fire, medicines, and tools.

Environmental Reconstruction

- Wood-Examine changes in forest zones
- Seeds and fruits-seasonality
- Palynology-Study of pollen grains, pollen zones and changes in plant communities
- Phytoliths-Silica from plant cells, and vegetation changes.

Pollen and Phytoliths

- Palynology (pollen analysis) has been used by North American environmental archaeologists for decades but its function has evolved from simply providing broad scale paleoenvironmental reconstructions to examine more closely the changing relationships between people and vegetation.
- Phytolith analysis has been used to a lesser extent, but is increasing. Both can be used to elucidate both the sequence of vegetation history and also the composition of agricultural fields and gardens, which allow our interpretations to account for the dynamic ways in which humans have manipulated their environs.

Fossil Cuticles and Diatoms

- Fossil Cuticles
 - Outermost layer of blades of grass, made of cutin-silica cells.
 - Used to identify changes in grassland environments.
- Diatoms
 - Unicellular algae that have silica walls.
 - Found in bottom of water (i.e. bogs).
 - Determine condition of water-whether brackish, fresh, or salty at different times.

Weeds vs. Domesticates

Both weedy and domesticated plants like to grow in soil that has been disturbed, whereas wild plants do not. Weedy plants possess a number of characteristics that enable them to survive on their own as given below:

- they are good at dispersing their own seeds,
- their seeds may have dormancy or the ability to lie in the ground for

many years before sprouting,

- different plants and sections of individual flowers mature at different rates, and
- overall the plants display phenotypic (morphological) plasticity or variability.

Nearly all of our domesticated plants were domesticated prehistorically by ancient people. Archaeologists believe that domestication was an unconscious process that occurred thanks to everyday interactions between people and plants.

Maize, beans, and squash were important in the diet of eastern North American Indians in the centuries just prior to contact by Europeans. Long domesticated in Mexico, these crops spread into the southwest and eastern North America. Their use is well documented in historic records.

Less well known is that they did not spread together or evenly into the same areas. More surprising, for thousands of years prior to their introduction, Indians domesticated and cultivated local, North American crops. Some of these ancient, native crops are now extinct.



Ethnobotanical Notes

Sources of *Vidari*

Cycas circinalis L.

Ipomoea digitata L.

Adenia hondala (Gaertn.) de Wilde

Trichosanthes cordata Roxb.

Pueraria tuberosa DC.

Lettsomia setosa Roxb.

Solanum verbascifolium L.

Other species of *Dioscorea*

Source: Journal of Research in Indian Medicine 1974; 9(4): 69-73.

Sources of *Badaward*

Centaurea phyllocephala Boiss.

Amberboa divaricata Kuntz.

Cardus nutans L.

Tricholepis procumbens Wight .

Fagonia arabica L.

Fagonia bruguieri DC.

Source: Journal of Research in Indian Medicine 1974a: 9(1): 92-3.

Source of *takkola*

Vitex altissima L.f. (fruit)

Note: *Takkola* is used in place of 'kankola' which consists of the fruits of *Piper cubeba* L.f. A critical study of 'takkola' revealed that they are the fruits of *Vitex altissima* L.f.

Source: Sachitra Ayurved 1979; 31(8): 764.

Adulterants in South Indian market

Principal plant	Adulterant
<i>Uraria picta</i> Desv.	<i>Uraria lagopodioides</i> (L.) Desv.
<i>Desmodium gangeticum</i> (L.) DC.	<ul style="list-style-type: none"> • <i>Pseudarthria iscid</i> Wight et Arn. • <i>Desmodium velutinum</i> (Willd.) DC.
<i>Barleria prionitis</i> L.	<ul style="list-style-type: none"> • <i>Strobilanthes heyneanus</i> Nees • <i>Strobilanthes sessilis</i> Nees var. <i>sessilioides</i> Cl.
<i>Vitex agnus-castus</i> L.	<ul style="list-style-type: none"> • <i>Vitex altissima</i> L.f. • <i>Vitex negundo</i> L.

Source: Ancient Science of Life 1985; 4(4): 211-16.

Identity of Kurabaka

Osmanthus fragrans Lour.

Source: Sachitra Ayurved 1975; 28(4): 103-112.

Identity of Buka

Rhododendron barbatum Wall. ex G. Don

or

Rhododendron arboreum Sm.

Source: Sachitra Ayurved 1975; 28(4): 103-12.

Source of vantambhaku

Solanum erianthum D. Don

Source: Aryavaidyan 2008; 21(4): 245-48.

Substitutes in South Indian market

Principal plant	Adulterant
<i>Piper retrofractum</i> Vahl	<ul style="list-style-type: none"> • <i>Piper schmidtii</i> Hook.f. • <i>Piper bantamense</i> Blume
<i>Scindapsus officinalis</i> Schott	<ul style="list-style-type: none"> • <i>Balanophora fungosa</i> J.R. et G. Forst. subsp. <i>indica</i> (Arn.) B. Hansen
<i>Coleus vettiveroides</i> K.C. Jacob	<ul style="list-style-type: none"> • <i>Coleus zeylanicus</i> (Benth.) Cramer • <i>Coleus barbatus</i> (Andr.) Benth. • <i>Coleus amboinicus</i> Lour. • <i>Pavonia odorata</i> Willd.

Source: Ancient Science of Life 1986; 6(1): 30-4.

Identification of *kuduhunci*

Momordica tuberosa (Roxb.) Cogn.

Source: Journal of Research in Indian Medicine 1977; 12(1): 118-21.

Neobotanic establishment of *nirvisi*

Polygonum rumicifolium Royle

Source: Sachitra Ayurved 1976; 28(9): 550-553.

***Rivia humilis* L.**

Phytochemistry: Sterols and triterpenopids.

Pharmacology: Hypotensive.

***Ochna obtusata* DC**

Anti-inflammatory

Source: Fitoterapia 1996; 67, 2, 117-120.

**Herbal folk remedies of Morni hills
(Haryana), India**

Blumea longifolia DC. (leaf juice)

Colebrookea oppositifolia Sm. (fresh leaf paste)

Inula cappa DC. (roots)

Ipomoea carnea Jacq. (leaves)

Kalanchoe integra (Medik.) Kuntze = (leaf paste)

Lactuca runcinata DC. (leaves and roots)

Leptadenia pyrotechnica (Forsk.) Decne. = (aerial parts)

Litsea glutinosa (Lour.) Robinson (stem bark)

Rhaphidophora pertusa (Roxb.) Schott (stem)

Rosularia alpestris (Kar. et Kir.) Boriss. (leaves)

Shorea robusta Gaertn.f. (stem)

Urtica ardens Link = (roots)

Source: Fitoterapia 1995; 5: 425-30.

Crude drugs: Sources and substitutes (reference to KTM crude drug market)

Source of crude drug	Substitute
<i>Inula racemosa</i> Hook.f.	<i>Piper</i> species
<i>Pluchea lanceolata</i> C.B. Clarke	<i>Vanda roxburghii</i> R.Br.
<i>Solanum surattense</i> Burm.f.	other <i>Solanum</i> species
<i>Cissus quadrangularis</i> L.	<i>Polypodium amoenum</i>
<i>Flacourtia jangomas</i> Raeusc	<i>Nephrolepis cordifolia</i> L.
<i>Butea monosperma</i> (Lam.) Taub	<i>Leea macrophylla</i> Roxb.
<i>Berberis aristata</i> DC.	<i>Mahonia napaulensis</i> DC.
<i>Mesua ferrea</i> L.	<i>Mammea longifolia</i> Planch. Et Triana
<i>Abies spectabilis</i> (D.Don) Spach	<i>Rhododendron anthopogon</i> D.Don
<i>Solanum indicum</i> L.	other <i>Solanum</i> species
<i>Terminalia arjuna</i> (Roxb.) Wight et Arn	<i>Machilus odoratissima</i> Nees
<i>Cordia dichotoma</i> Forst.	<i>Spondias axillaris</i> Roxb
<i>Onosma bracteatum</i> Wall.	<i>Taraxacum officinale</i> Linn.
<i>Tecoma undulata</i> G.Don	<i>Rhododendron arboreum</i> Sm.

Source: Sachitra Ayurved 1991; 44(4):284-90.

Source of *bharangî* in Madhya Pradesh

- Premna corymbosa* Rottl.
- Picrasma quassioides* Bennett
- Gardenia turgida* Roxb.
- Gardenia latifolia* Ait.

Source: Journal of Research in Indian Medicine 1973b; 8(1): 86-94.

Sources of *balâ* in Kerala

Main source: *Sida rhombifolia* L. var. *retusa* L.

Substitutes

- Sida cordifolia* L.
- Sida rhombifolia* var. *rhomboidea*
- Sida spinosa* L.
- Sida acuta* Burm.
- Sida veronicaefolia* Lamk.
- Abutilon indicum* G. Don

Adulterants

Pavonia odorata L.

Urena lobata L.

Source: Journal of Research in Indian Medicine 1972; 7(1): 37-45.

Sources of safed musli

Widely accepted source: *Chlorophytum borivillianum* Sant. et Fernandez

Other sources

Chlorophytum arundinaceum Baker

Chlorophytum attenuatum Baker

Chlorophytum breviscapum Dalaz

Chlorophytum tuberosum Baker

Asparagus adscendens Roxb.

Asparagus sarmentosus L.

Source: Sachitra Ayurved 2003; 55(11): 866-69.

Sources of pasanbheda

Botanical name	Natural order	Parts used
<i>Bergenia ligulata</i> (Wall.) Engl.	Saxifragaceae	Seeds
<i>Bryophyllum calycinum</i> Salisb.	Crassulaceae	Leaves
<i>Aerva lanata</i> Juss.ex Schult.	Amaranthaceae	Roots
<i>Bridelia crenulata</i>	Euphorbiaceae	Stem bark
<i>Coleus amboinicus</i> Lour.	Lamiaceae	Leaves
<i>Decalepisarayalpatra</i> Joseph & Chandrasekharan	Periplocaceae	Roots
<i>Homonoia riporia</i> Lour.	Euphorbiaceae	
<i>Rotula aquatica</i> Lour.	Boraginaceae	Whole plant

Source: Ethnobotanical Leaflets 2007; 11: 73-75.

Source of tilvaka

Viburnum nervosum Hook. f. and Thoms.

Source: BMEBR 1982; 3: 205-11.

***Solanum jasminoides* Paxt.**

Source of soluble and protein bound amino acids.

Source: BMEBR 1982; 3: 103-6.

Adulterants of *Trianthema portulacastrum* L.

Achyranthes repens L.

Boerhavia diffusa L.

Eclipta prostrata (L.) L.

Trianthema portulacastrum L.

Trianthema decandra L.

Trianthema pentandra L.

Source: Journal of Theoretical and Experimental Biology 2011; 7 (3): 127-134.

Phytochemistry of *Inula cappa* L.

Delphinium 3:5-diglucoside and quercetin 3-glucoside.

Source: BMEBR 1982; 3: 292-4.

Phytochemistry of *Olax scandens* Roxb.

Octacosanol, β -sitosterol, oleanolic acid and glucosides of β -sitosterol and oleanolic acid.

Source: BMEBR 1982; 3: 167-9.

***Cyperus rotundus* L., a substitute for *Aconitum heterophyllum* Wall. ex Royle**

The substitution is based on identical *ayurvedic* energetics.

Source: Journal of Ayurveda Integrated Medicine 2010; 1(1): 33-9.

Adulterants of *Crocus sativus* L.

Calendula officinalis L.

Carthamus tinctorius L.

Arnica montana L.

Pulicaria crispa L.

Source: Sachitra Ayurved 1995; 48(6): 635-37.

Adulterant of *Holarrhena antidysenterica* Wall

Wrightia tinctoria (Roxb.) R.Br.

Source: Indian Journal of Pharmacy 1948; 4: 91.

Journal of Pharmacy and Pharmacology 1962; 14: 41-5.

Source of *lakshmana*

Ipomoea muricata (L.) Jacq.

Cynoglossum lanceolatum Forssk.

Solanum ferox L.

Source: Ethnobotanical Leaflets 2007; 11: 141-7.

Chemical analysis of fat of *Heterophargma quadrioculare* (Roxb.) Schum.

Palmitic acid, stearic acid, linoleic acid, oleic acid and unsaponifiable matter (β -sitosterol and β -amyrin).

Source: BMEBR 1982; 3:162-4.

Flavones of *Linaria ramosissima* Wall

Pectolinarigenin and its 7-rutinoside, pectolinarin.

Source: BMEBR 1982; 3: 51-3.

Chemical analysis of *Pisonia grandis*

Octacosanol, β -sitosterol, β -spinasterol, β -sitosterol glucoside, dulcitol and quercetin.

Source: BMEBR 1990; 10(1-2): 110-1.

Source of *jitasaya mooli*

Hamiltonia suaveolens Roxb. Peopel of Panvel used the plant for treatment of diabetes.

Source: BMEBR 1990; 10(1-2): 103-9.

Glycoside of *Lepidagathis hyaline* Nees

Naringin.

Source: BMEBR 1990; 10(1-2): 95-7.

Glycoalkaloids of *Solanum verbascifolium* L.

Solanine, solasodine and solamargine

Source: BMEBR

Sources of *padamcarini*

Nervilia aragoana (Gaud.) Ridl.

Habenaria grandifloriformis Blatter et McCann

Nervilia plicata (Andr.) Schltr.

Nervilia prainiana (King et Pantl.) Seidenf. et Smitin

Source: Aryavaidyan 2006/2007; 20(2): 74-79.

Chemical composition of *Clerodendron heterophyllum* (Poir.) R. Br.

(24-S)-ethylcholesta-5,22,25-triene-3-ol Scutellarein 6 hydroxy luteolin

Source: BMEBR 1988; 10(3-4): 188-9.

Note: *C. heterophyllum* is grown as hedge plant.

Chemical composition of *Clerodendron splendens* G. Don

Flavone: Hispidulin and its glycoside.

Source: BMEBR 1988; 10(3-4): 188-9.

Note: *C. splendens* is native to western Africa.

Identity of *gilodhya*

Ceropegia vincaefolia Hook. (Asclepiadaceae)

The plant is mentioned in *Sushruta Samhita* Sr. 43/11.

Source: BMEBR 1988; 10(3-4): 193-8.

Note: *C. vincaefolia* is endemic to Western Ghats, Evergreen Forests. The plant is critically endangered species.

Botanical identity of *Phuinum*

Clerodendrum colebrookianum Walp. (Verbenaceae)

It is a perennial shrub, endemic to north eastern region of India.

The plant is used for the treatment of hypertension in Mizoram. Besides, it is used against other ailments like diabetes, rheumatism and stomachache.

Source: BMEBR 1997; XVIII (1-2): 18-29.

Asian J Phar Biol Res 2012; 2(4): 256-261.

Botanical identity of *Gambasu*

Cordyceps sinensis is a fungus that parasitizes larvae of ghost moths and produces a fruiting body valued as a herbal remedy. It occurs in alpine meadows of Kumaon Himalaya. The medicinal properties of the fungus are similar to drug 'Gonasi' described in *Sushruta Samhitâ* where it has been described as tonic remedy. 'Gonasi' is drug of controversial origin.

Source: BMEBR 2003; XXIV (1-4): 121-26.

Sachitra Ayurved 2001; 54(5): 408-411.

Sources of Soma

Amanita muscaria (L.) Pers.

Argyreia nervosa (Burm.f.) Bojer

Asclepias acida Roxb.

Basella alba L.

Cannabis sativa L.

Ceropegia bulbosa Roxb.

Ceropegia decaisneana Wight

Ceropegia elegans Wall.

Humulus lupulus L.

Eleusine coracana (L.) Gaertn.

Ephedra vulgaris Wall.

Ichinocarpus frutescens

Nelumbo nucifera Gaertn.

Peganum harmala L.

Periploca aphylla L.

Rheum emodi Wall.

Ruta graveolens L.

Saccharum sp.

Sarcostemma acidum Roxb.

Sarcostemma brevistigma W. and A.

Sacrostemma brunonianum

Sarcostemma intermedium Decne.

Sarcostemma viminale (L.) R.Br.

Sorghum sp

Vitis vinifera L.

Sources: BSOAS 1971; 34: 331-362.

Hamdard 1983; 26(3): 51-65.

Aligarh Journal of Oriental Studies 1988; 5(1/2): 77-82.

Economic Botany 2004; 58: 147-173.

Journal of Human Ecology 15(1): 19-26.

Asian Agri-History 2006; 10(3): 245-8.

Amruth 2008; 4(2): 3-4.

Some experts do not consider *A. muscaria* and *P. harmala* as soma.

Source: William L. Smith and Carl Suneson (Eds.), 1995; 81-90.

Identification of the Vedic plant *Udsadna*

Udsadna is regarded as an epithet of *Soma*.

Source: SHM 1980; 4(3): 190-3.

Sanjivani

Selaginella bryopteris (L.) Bak.

Sources: Journal of Economic and Taxonomic Botany 1982; 3: 309-11.

Amruth 2008; 4(6): 42-3.

An adulterant of *Ativisa* (*Aconitum heterophyllum* Wall)

Chaerophyllum villosum Wall. ex DC (Apiaceae)

Source: Journal of Research in Indian Medicine 1969; 4(1): 68-72.

Note: *C. villosum* is widely distributed in East Asia Himalayas from India to Bhutan, Nepal and China and widely grows in moist shady places, roadsides or open grassy places at elevations of 2100-3500 m.

An adulterant of *Ativisa* (*Aconitum heterophyllum* Wall)

Cryptocoryne spiralis Fisch. ex Wydler (Araceae)

Source: Ancient Science of Life 1981; 1(4): 200-5.

Botanical source of *Granthika Tagara*

Nymphoides macrospermum Vasudevan (Menyanthaceae).

Source: Current Science 1979; 48(16): 734-5.

Note: *N. macrospermum* is endemic to coastal Kerala.

A new botanical source of *Granthika Tagara*

Source of *Granthika Tagara* from Dakshina Kannada district of Karnataka has been established as *Cryptocoryne spiralis* (Retz.) Fisch. ex Wydl., family Araceae.

Source: Journal of Herbs, Spices and Medicinal Plants 2008; 10(1).

Note: *C. spiralis* is a common plant in India, where it can be a weed in rice fields.

Identification of *Vidsdnukanda*

Crinum defixum Ker-Gawl. (Amaryllidaceae).

Source: Journal of Research in Indian Medicine 1977; 12(4): 114-23.

Note: *C. defixum* has wide geographical distribution in India and is common on riverbanks and swampy places in Deccan and Bengal. In Asom it is found abundantly growing wild on riverbanks of Dhansiri River.

Poisonous plants

Kâlkûta

Kâlkûta originated after the death of demon *Prithumâlî*. Gum-resin of the tree is known as *Kâlkûta*. It is found in *Ahiksetara*, *Srngbera*, *Konkana* and *Malya*.

Vatsanabha (*Aconitum ferox* Wall. Family: Ranunculaceae)

The leaves of *Vatsanabha* resemble with *sinduvvara* (*Vitex trifolia*), morphology is similar to the calf's umbilicus and no other plant grows in vicinity of *Vatsanabha*.

Srngaka (*Aconitum chasmanthum* Stapf ex Holmes NO: Ranunculaceae)

The plant when tied to the horn of a cow, results in the red colour of the milk.

Pradipana

Pradipana is red in color, shining and acts as an irritant.

Halâhala

Fruit of *Halâhala* is breast shaped, leaves are similar to *Talpatra* and no other plant grows in the vicinity. It is found in *Kisikandha*, *Himalaya*, south Indian oceans and *Kokana*.

Brhamaputra

Brhamâputra is a black colored plant found in *Malyaparvata*.

Hâridra

Roots of *haridrâ* resemble with rhizomes of *haridra* (*Curcuma longa*).

Saktuka

Glands of *Saktuka* contain a substance similar to powder of *saktu*.

Saurâctrika

Saurâctrika is found in *Saurastara*.

Source: Dhanvantri Nighantu.

Sources of *Chirayata*

Swertia alata Royle ex D.Don
S. alternifolia Royle
S. angustifolia Ham. ex D.Don
S. bimaculata Hook.f. et Thoms.
S. chirayita (Roxb. ex Fleming) Karsten
S. ciliata (G.Don) Burt
S. cordata Wall.
S. corymbosa Wight
S. densifolia (Griseb.) Kashyapa
S. lawii Burkill
S. macrosperma Clarke
S. petiolata Royle
S. pulchella Ham.
S. speciosa D.Don

Common adulterants or substitutes of *S. chirayata*

S. alata
S. bimaculata
S. ciliata
S. corymbosa
S. densifolia
S. lawii
S. angustifolia
S. corymbosa
S. pulchella

Source: Ancient Science of Life 1996; 15: 226-9.

Identity of Gaozaban flowers

Echium amoenum Fisch. et C.A. Mey

Source: Journal of Research in Indian Medicine 1970; 5: 154.

Identity of salam gatta

Habenaria grandifloriformis Blatt. et McCann

Source: Current Science 1975; 44: 277.

Botanical identity of *Sugandhbâlâ*

Limnophila indica (L.) Druce

Limnophila rugosa (Roth.) Merrill

Source: Journal of Research in Indian Medicine 1978; 13: 110-4.

Identity of Kamraj

Helminthostachys zeylanica (L.) Hook

Vitis araneosus Dalz. et Gibbs. ex M. Laws.

Vitis trifolia L.

Selaginella rupestris Spreng.

Source: Journal of Research in Indian Medicine 1973; 8: 40-6.

Identity of *Sahacara*

Acanthus ilicifolius L.

Barleria courtallica Nees

B. cristata L.

B. prionitis L.

B. strigosa Willd.

Calacanthus grandiflora (Dalz.) Radlk.

Ecbolium viride (Forsk.) Merrill

Justicia betonica L.

Source: Shriram Sharma and Laxmi Bhargava (Eds.), 1990, 77-80.

***Tiliacora racemosa* Colebr**

Family: Menispermaceae

Distribution: Tropical India

Description: Evergreen climbing shrub

Chemical composition: Tiliarine, tiliarsine, tiliacoline, tiliacorinine, nortiliacorinine A and nortiliacorinine B

Therapeutics: Given in cancer

Preclinical research: Antifungal and cytotoxic

Part used: Roots

Sources: Phytotherapy Research 2004; 18: 595-600

Current Science 1967; 36, 43-44

Indian Journal of Pharmacology 1976; 8: 187-188

Sachitra Ayurved 1985; 38: 347-355

***Pericampylus incanus* Miers.**

Family: Menispermaceae

English name: Broad leaves moon seed

Distribution: Eastern Himalayas

Description: A woody climber

Chemical composition: Mucilage

Therapeutics: Given in asthma, headache and fever

Part used: Leaves

Sources of *Secacul mishri****Pastinaca secacul* L.**

Family: Apiaceae

Common name: Wild parsnip

Distribution: Native to Europe

Description: Biennial herb

Therapeutics: Used for low sperm count

Chemical composition: Starch

Part used: Roots

***Trachydium lehmanni* Benth.**

Family: Apiaceae

English name: Egyptian misree

Hindi name: Dudhali, Satali, Sawali

Distribution: Persia

Description: Biennial herb

Therapeutics: Used for low sperm count

Chemical composition: Saccharine and starch

Part used: Roots

***Eryngium caeruleum* Bieb**

Family: Apiaceae

Hindi name: Pahadi gajjar

Distribution: Kashmir and Western Himalayas

Description: A biennial herb

Therapeutics: Used for low sperm count

Chemical composition: Essential oil

Part used: Roots

Source of Salab gatta

Orchis sp.

***Delphinium brunonianum* Royle-Source of Sprkkâ**

Family: Ranunculaceae

English name: Musk Larkspur

Hindi name: Makhoti

Description: A high altitude plant, found in West Himalayas at 4300-5500 m

Description: A perennial herb

Chemical composition: Norditerpenoid alkaloid: Delbruninol

Therapeutics: In the Himalayas it is only used to destroy ticks on animals

Toxicity: All parts of the plant are toxic. The plant is most toxic when it is young

Note: *D. brunonianum* is used as substitute for *tagara*.

Sources: Sachitra Ayurved 2001; 53: 618-22.

Heterocycles 1999; 51.

***Delphinium caeruleum* Jacquemont**

Family: Ranunculaceae

Description: Alpine areas from 2500 to 5000 m

Description: A perennial herb

Chemical composition: Norditerpenoid alkaloids: Caeruleine, tatsiensine, delcosine, and lycoctonine

Therapeutics: The roots are used to kill maggots in the wounds of goats

Toxicity: All parts of the plant are toxic. The plant is used externally only.

***Valeriana pyrolaefolia* Decne: Source of Dhyâmaka**

Family: Valerianaceae

Distribution: Temperate Himalayas, from Kashmir to Kumaon

Description: A perennial herb

Therapeutics: Powdered rhizome is used to treat spasm and habitual constipation

Sources: Sachitra Ayurved 2001; 53: 618-22

Journal of Pharmacy and Pharmacology 1960; 12:739

***Paeonia officinalis* L. - Source of Ud-saleeb**

Family: Ranunculaceae

English name: Common peony

Hindi name: Makhoti

Distribution: Native to Southeast Europe

Description: A perennial herb

Chemical composition: Sterols and flavonoids: Paeoniflorin, paeonin and paenol

Therapeutics: Used in paralysis and epilepsy

Preclinical pharmacology: Antihypertensive and gastroprotective

Habenaria pectinata* (Smith) D. Don-Source of *safed musali

Tuber is mixed with *khoya*, greater cardamom and jaggery and taken thrice a week for 4 weeks in case of joint pains.

Source: Indian Journal of Science Research 2011; 2: 125-7.

New source of *Jivaka-Rshabhaka*

Lipasis rostrata Rehd. (Orchidaceae)

New source of *Lajjalu*

Neptunia oleracea Lour

Common name is water mimosa

Source: Fitoterapia 1998; 69, 7-12.

Substitute for *Lavandula stoechas* L.

Prunella vulgaris L.

Sources of *Gaozabaan*

Anchusa italica Retz.

Borago officinalis L.

Caccinia crassifolia O. Kuntze.

Sources of Unani drug Gaozabaan

Anchusa strigosa Labill

Echium amoenum Fisch. and Mey.

Ayurvedic drugs in Unani Materia Medica

Aleurites moluccana (L.) Willd.

Andropogon miliaceus Retz.

Atalantia monophylla (L.) Correa

Centaurea behen L.

Chrozophora rottleri (Geis.) A.Juss. ex Spreng.

Commiphora myrrha (Nees) Engl.

Cordia gharaf (Forsk.) Ehrenb. ex Asch.

Euphorbia resinifera Berg.

Ipomoea hederacea (L.) Jacq.

Sisymbrium irio L.

Sources: Ancient Science of Life 1990; 9: 191-201.

Journal of Research in Indian Medicine 1992;11: 25-32.

***Nilabhrngaraja* in Siddha**

Caesulia axillaris Roxb.

Family: Asteraceae

English name: Pink Node Flower

Distribution: Himalayas, at altitudes of 150-1500 m

Description: An erect annual herb

Chemical composition: Essential oil containing limonene and α -asarone

Therapeutics: Used in paralysis and epilepsy

Preclinical pharmacology: Antifungal and antiaflatoxigenic

Sources of *Kakanasa*

Asclepias currasavica L. (Apocynaceae)

Trichosanthes cucumerina L. (Cucurbitaceae)

Dicliptera paniculata (Acanthaceae)

Martynia annua L. (Martyniaceae)

Source: Indian Journal of Fundamental and Applied Life Sciences 2013; 3: 278-88.

Substitute for *Rasna* in Madhya Pradesh

Blepharispermum subsessile DC.

Family: Asteraceae

Distribution: Western Ghats, Evergreen Forests

Description: A glabrous shrub

Chemical composition: Chromenes

Therapeutics: Used in rheumatism

Part used: Leaves

Preclinical pharmacology: Antiferility, antifeedent and antifungal

Journals dealing with Ethnobotany

Journal	website
<i>Ethnobotany Research and Applications</i>	http://www.ethnobotanyjournal.org
<i>Asian Journal of Ethnopharmacology and Medicinal Foods</i>	
<i>Journal of Traditional Medicine & Clinical Naturopathy</i>	
<i>The Journal of Ethnobiology and Traditional Medicine</i>	
<i>Journal of Ethnobiology and Ethnomedicine</i>	http://www.ethnobiomed.com
<i>International Journal of Phytotherapy and Ethnobotany</i>	
<i>Journal of Ethnobotany</i>	http://www.cloud-journals.com/ethnobotany.html
<i>American Journal of Ethnomedicine</i>	http://www.ajethno.com
<i>International Journal of Ethnobiology and Ethnomedicine</i>	http://bmrjournals.com/Journals/International-journal-of-ethnobiology-and-ethnomedicine
<i>International Journal of Ethnomedicine and Pharmacognosy</i>	http://www.ijepharm.com
<i>African Journal of Traditional, Complementary and Alternative Medicines</i>	http://journals.sfu.ca/africanem/index.php/index/index
<i>Ethnobotanical Leaflets</i>	http://www.siu.edu/~eb/

Ethnobotany societies

Society	Address
Society of Ethnobiology	Department of Sociology and Anthropology University of Puget Sound1500 North Warner St., CMB#1092Tacoma, WA 98416
The International Society of Ethnobiology	14 School Street P.O. Box 303Bristol, Vermont 05443 USA
The Ethnobotanical Society of Nepal	Guchha Marg, New Road, MJ Mart, 6th FloorC/o Central Department of Botany, Tribhuvan UniversityKritipur, Kathmandu, Nepal
Center for International Ethnomedicinal Education and Research	
The Society for Ethnomedicine	http://www.ag-ethnomedizin.de/e_index.html

Ethnopharmacological societies

Society	Address
International Society for Ethnopharmacology	Institute of Pharmaceutical Sciences Dept. of PharmacognosyKarl-Franzens- Universität GrazUniversitätsplatz 4/I
Society for Ethnopharmacology University, Kolkata 700032, India	School of Natural Product StudiesJadavpur
European Society of Ethnopharmacology	

Ethnobotany Databases

- American Indian Ethnobotany
(<http://waffle.nal.usda.gov/agdb/amindeth.html>)
- Daniel Moerman's Ethnobotany Database
(<http://herb.umd.umich.edu/>)
- Ethnobotanical Database of Bangladesh
(<http://www.mpbd.info>)
- Ethnobotany of the Peruvian Amazon
(<http://www.biopark.org/Plants-Amazon.html>)
- Gwich'in Ethnobotany (<http://plants.gwichin.ca/database>)
- International ethnobotany Database (<http://ebdb.org>)
- Phytochemical and Ethnobotanical Databases
(<http://www.ars-grin.gov/duke>)
- The Mesoamerican Ethnobotanical database (http://emuweb.fieldmuseum.org/botany/search_mesoamerican.php)

Courses on ethnobotany

M Sc (Ethnobotany)-The University of Kent

Certificate in Ethnobotany - University of Alaska Fairbanks

B Sc Ethnobotany-University of Hawaii at Manoa

B Sc (Ethnobotany)-Frostburg State University

Tropical Ethnobotany- Institute for Tropical Ecology and Conservation, Panama

Ethnobotany-Fairhaven College of Interdisciplinary Studies, Western Washington University

M Sc (Medicinal Plants) - The Global Open University, Nagaland.

M Sc (Medicinal Plants) - University of Westminster

(M Sc (Ayu medicinal plants) - Gujarat Ayurved University, Jamnagar

M Sc Medicinal Plants and Functional Foods - Newcastle University

Herbal Glossary

Active constituent- a herbal drug or herbal drug preparation, its entirety is regarded as the active constituent.

Adaptogen- an agent that invigorates or strengthens the system.

Alterative- an agent used for purifying blood.

Anabolic- an agent having steroidal action.

Analeptic- an agent used to boost respiration and circulation.

Anodyne- an agent that relieves pain on local application.

Antiarrhythmic- an agent used for treatment of heart disease.

Antibiotic- an agent used for killing microorganisms.

Anticoagulant- an agent used for preventing blood clotting.

Antidepressant- an agent used for counteracting depression.

Anthelmintic- an agent used to kill worms.

Antiperiodic- an agent used for preventing relapse fever.

Antipruritic- an agent used to cure itching.

Antirheumatic- an agent used for curing arthritis and rheumatism.

Analgesic- an agent used for preventing pain.

Anti-inflammatory- an agent used for preventing inflammation.

Antipyretic- an agent used for lowering the fever.

Antiseptic- an agent used for preventing the growth of microorganisms.

Antispasmodic- an agent used for relieving the spasms of voluntary and involuntary muscles.

Aphrodisiac- an agent used to stimulate the sex urge and maintain vitality.

Aperient-an agent used for mild laxation.

Ayurveda- the ancient healing system of India.

Bruising- a process of smashing of different parts of a medicinal herb in a pestle and mortar.

Cathartic- an agent used to relieve severe constipation.

Carminative- an agent used to dispel gas from the intestine and prevent distension.

Cholagogue- an agent used to promote the flow of bile.

Choleretic- an agent that stimulates the formation of bile.

Convulsant- an agent which induces seizures.

Counterirritant - (See Rubefacient.)

Crude drug- the form of the medicinal herb unchanged by processing other than separation of parts, drying or grinding.

Decoction- a process of boiling a coarsely bruised drug in water in tinned pots with covers for a definite period.

Diaphoretic- an agent used for increasing perspiration through the skin.

Diuretic- an agent used for increasing urine flow.

Ecbotic- an agent used for stimulating uterine musculature.

Elutriation- a process of separation of the coarser particles of a powder from the finer ones.

Emetic- an agent used for inducing vomiting.

Emollient- an agent which softens the skin.

Expectorant- an agent used to promote the expulsion of mucus from the respiratory tract.

Expression- a process of pressing out juice or oil from plant products.

Extract- a process of manufacturing of concentrated preparations of the active principles of the vegetable drugs.

Fluid extract- a liquid extract of raw plant material, usually of a concentration ratio of 1 part raw herb to 1 part solvent.

Febrifuge- an agent used to reduce fever.

Hemostatic- an agent used to prevent flow of blood.

Hepatoprotective- an agent used for preventing injury to the liver.

Hygroscopic- a substance that readily attracts and retains water.

Hypnotic- an agent used to induce sleep.

Hypolipidemic- an agent which reduces high levels of cholesterol.

Incineration- a process of heating the organic substances with access of air, so that all the carbonaceous matter is burnt.

Infusion- a process of treating a moderately comminuted drug in a muslin bag soaked in cold or hot water.

Levigation- a process of grinding of solid substance with water to make a paste and dry.

Maceration- a process of soaking a ground up drug in a solvent and expression of fluid from it.

Marker compound- chemically defined constituents of a herbal drug, which are of interest for control purposes, independent of whether they have any therapeutic activity or not.

Medicated oil- oil preparation obtained by steeping the medicinal herb in oil for several days or months.

Sifting- a process of passing a powdered drug through a sieve to obtain powder of uniform strength.

Nervine- an agent used for improving the function of the nerves.

Nootropic- an agent having memory enhancing activity.

Pharmacy- the study of scope and the preparation of materials in suitable forms for use in Medicine.

Rubifacient- an agent used for increasing the blood supply to the skin, when applied locally.

Sedative- an agent used for calming the functional activity of the body.

Standardization- a process of fixing the quantity of the active constituent of a medicinal agent.

Stimulant- an agent used for boosting metabolism and circulation.

Stomachic- an agent used to promote stomach function.

Tincture- alcoholic solution of active constituents of vegetable drugs.

Trituration- the process of rubbing solid substances into finer ones with the help of a pestle and mortar.

Tonic- an agent used to increase energy and vigour in a specific part of the body.

Vasodilator- an agent used to dilate the blood vessels.

Vulnerary- an agent used to promote the healing of new cuts and wounds.



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ETHNOBOTANY

Before the availability of synthetic drugs, man was completely dependent on medicinal herbs for prevention and treatment of diseases. The use of the medicinal herbs for curing disease has been documented in the history of all civilizations. Today herbal research is a worldwide phenomenon and scientists are exploring safe and effective remedies from plants. The literature on ethnomedicinal plants is scattered and need of the hour is to assemble the scientific work on one platform. This book is humble attempt in this direction. We hope it will fulfil the deficiency of standard material on ethno medicinal plants which has been felt for a long period of time.

The book, in its present form is meant for the degree students of Botany and Agriculture and covers the syllabus of a majority of the Indian Universities. The book deals with a detailed account of the various aspects of Ethnobotany so as to equip the students with thorough information. Without such information it is not possible to follow a comparative account and a generalized treatment of the subject at advanced levels.

ISBN: 978-81-7164-168-0

